TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 9.] 1917. [No. 3.

APPLIED HYGIENE IN THE TROPICS.*

By Colonel W. G. King, C.I.E., I.M.S. (Retired).

REPORTS.

Corporation of Madras, 1915–16.†

In this Report, the relation which sanitation bears to finance, and the influence of factors inhibiting, or aiding, advance are well illustrated by concrete facts :—

Inter-relation of water-supply and drainage.

"The maximum water-supply of the city in former days, when water was distributed by gravitation, was approximately seven million gallons per day. The new pumping installation at Kilpauk supplies on an average twice that quantity, and has on occasion supplied up to 20 million gallons per day. Though the cost of this pumping (inclusive of establishment) during 1915–16 amounted to more than a lakh, no reasonable person could wish for a return to the old conditions. To the part played by increased water-supply in improving our vital statistics in the past year the Health Officer has testified ; it is a fair assumption that much of the deplorable mortality of Madras has hitherto been due not so much to bad water as to the absolute lack of water of any kind. Increased water-supply necessarily means increased sewage ; the cost of sewage pumping has risen from Rs.60,000 in 1903–04 to Rs.154,000 in 1915–16, and with the laying of water pipes into parts of the city hitherto untouched this cost will rise still further in 1916–17." [p. 3.]

* [During the previous period of issue of the "Sanitation Number" of the Bulletin, the endeavour of the writer has been to cull from official and other Reports descriptions of methods of Applied Hygiene as adopted in various and often widely separated areas of the Tropics, and contrast these and the opinions on which they are supported by the sanitarians respectively concerned. This is ordinarily the process by which the sanitarian arrives at his conclusions of the value of new or untried methods, before advising their employment by public authorities. In the present Number the method is adopted of quoting extracts from Reports more fully, leaving the reader, as evidence is thus accumulated, to make his own contrasts.]

† Administration Report of the Corporation of Madras for 1915–1916. 1916. Madras : Printed by Thompson & Co., 33, Popham's Broadway.

(C340) Wt.P3137/63. 1,850. 2.17. B.&F.Ltd. G.11/4 A

The tram as a factor in relief of overcrowding.

"Congestion in Madras will never be relieved till we have more tram lines. The Corporation has acquired for demolition extensive rookeries in Triplicane; these cannot be pulled down until some possibility of accommodation is provided for the evicted. And poor people cannot move far from their work unless there be available some cheap and easy method of getting back to it." [p. 5.]

Demonstration as a factor in teaching the uneducated classes.

"I alluded to an increasing spirit of co-operation apparent in the attitude of the people towards our anti-malarial campaign. It is gratifying to record that this spirit has waxed, not waned. The drainage of the Puraswakkam swamps has been designed by Mr. Barker, and part of the design executed with marked success." [p. 5.]. "The construction of the Model Paracherri of 34 tenements in Cemetery Road, with the exception of the latrine which was under progress, was completed during the year at a total cost of Rs.18,130; and the tenements have been let to the conservancy sweepers at a rental of As.8 per tenement." [p. 23] "His Excellency the Governor of Madras offered Rs-1,500 to provide prizes for a competition for the best design for the construction of model dwelling houses for the poor, and Mr. Madeley also offered Rs-100 for the best design of water-supply and drainage for certain classes of houses." [p. 4.]

Educate a dying people or first render life possible?

"One portion of the building programme, I regret to say, has been dropped temporarily at least. The Corporation has been unable to carry out the provision of two primary schools for each division of the city. But when money is scarce, and the claims of sanitation and primary education come into conflict, it is, I think, but right and proper that sanitation should take precedence. It is of little use to educate a child while neglecting what best effort may be made to keep him alive; there are many agencies which provide the three R's, but the responsibility for the public health is primarily on the Corporation." [p. 6.]

Prevention of waste of water.

"The consumption during the past year is approximately twice what it was before the new water works were opened. . . . To reduce this waste, the Corporation has, during the past year, introduced regulations and rules to prevent waste, contamination, and misuse of water, and has also adopted the principle recommended by the Special Engineer of having two classes of house services: a first class service in which the consumer is required to hire water meters from the Corporation, and to adopt only specified fittings, the positions and numbers of which have to be approved, and a second class service in which the consumer is allowed to fix one tap of approved pattern, provided it is placed in such a position that it is visible fromthe road, and can at all times be inspected by the Municipal Staff.

"The Corporation has also introduced a scale of fees for connecting and testing house services, and for the rent of meters. The strict enforcement of the regulations should minimise waste of water due to leakage and misuse in the house services. In addition, there is undoubtedly leakage in the street pipes. This leakage is very difficult to discover, especially where the pipes are laid in sand.

"In Madras, iron pipes have a shorter life than in many other Cities, and experience has shown that a large proportion of the pipes laid 20 years and more ago are unsound. From these unsound pipes which include many house communication pipes, water must be escaping in thousands of small leaks. Many small leaks will account for a large total loss, which will be quite invisible in porous soils where the water gets away readily. To detect these hidden leaks, a complete waste-water meter system has been designed, and plans and specifications drawn up. The calling for tenders has been postponed on account of the war.

"With a view to reducing waste, a small special staff was sanctioned on 20th September 1915, to carry out house to house inspection. Up to 31st March 1916, 11,500 houses were inspected of which some 5,000 had leaky fittings." [p. 27.]

Does sewage irrigation pay in the tropics ?

"*Grass Farm—Tondiarpet.* The farm was worked departmentally, and the total receipts from all sources amounted to Rs.38,209. 2. 9. against Rs.37,438. 1. 1. in the previous year. There was on hand on the 31st March 1916, a stock of 50 tons and 1,516 lbs. of hay, the value of which at Rs.50 per ton amounted to Rs.2,533. 13. 5, so that the total income from the farm for the year under review may be placed at Rs.40,743. [p. 15.]

"The Special Engineer has submitted an approximate estimate amounting to Rs.12 lakhs for the acquisition of land, levelling and laying out the farm, purchasing and erecting pumping plant, and constructing pumping mains, channels, and distributaries and everything else necessary to force the sewage the three miles which separate the old and proposed farms, and to distribute it over the latter." [p. 30.]

Conservancy.

"Latrines. The acquisition of land for the construction of a flush-out latrine in Thambu Chetty Lane and the construction of a flush-out latrine at Polu Naicken Street Perambur was completed during the year.

"A new type of a sanitary urinal called 'Torfeit-Urinal' was installed in Wall Tax Road near the Central Station as an experimental measure, as it was represented by the manufacturers, Messrs. Vacha & Co., of Bombay, that by the introduction of these urinals, flushing by water might be entirely dispensed with and the latrines would be free from smell." [p. 23.]

Water-supply and health.

"The death-rate returns appear to prove that the new water-supply has improved the healthfulness of the city. The works were opened on 17th December 1914, and it is very interesting to note that while the death-rate during 1914 was 46·6 per 1,000, it dropped to 36.0 in 1915. Moreover, this death-rate is the lowest during the last 20 years with the exception of that of 1897 when it was 35·5. While it may be a coincidence that so great a drop in the death-rate has occurred during the first year that the new water-supply has been in use, still the fact that it is the lowest death-rate for so many years, makes it fairly safe to infer that the new supply has largely added to the healthfulness of the City, because, except for the water-supply, the health factors must have been at least as favourable during several other years." [p. 28.]

State of North Borneo.

The Territorial Medical Report for 1914 for the State of North Borneo is written by Dr. W. B. Orme, Principal Medical Officer. The estimated population of the area was, in the period reviewed, 216,670. Registration of births and deaths was introduced in 1914. Judged by figures so gained, the birth-rate only amounted to 13·01 and the death-rate "exclusive of epidemic diseases" to 12·51 per mille. A part of the Report is occupied by a reproduction of a circular written for guidance of District Officers on the subject of water-supply.

Rainwater separator. Having pointed to the fact that rainwater as collected from roofs is often much contaminated, he describes precautionary measures as follows* :—

"Many separators which reject the first washings have been introduced but are mostly liable to get out of order. Personally I know of one method

* State of North Borneo Territorial Medical Report, 1914. Sandakan: Govt. Printing Office. [p. 5.]

only which gives good results : a house is fitted with an ordinary guttering and rain-water discharge pipe, the lower opening of the latter being fitted with a plug. Some two feet from the top of the discharge pipe a second pipe, of the same diameter, comes off at a right angle and is carried to the storage tank. At the onset of rain the first washings are allowed to flow down the ordinary channel and only when the water is quite clear and sweet is the plug introduced causing the water to rise in the discharge pipe and overflow into that supplying the storage tank.

" Storage tanks are best constructed of re-inforced concrete or galvanised iron. Wood is objectionable as vegetable growth occurs round the sides and Lead is distictly dangerous especially for soft rainwater which readily takes up the poison.

" The tanks should be protected from the sun and it is of paramount importance to adequately screen the opening of the tank with fine copper gauze to prevent the entrance of mosquitoes ; moreover by so doing it will be found that from time to time a considerable quantity of debris is prevented from entering the tank."

Protection of vaccine lymph during transit in the tropics.

" In order to avoid a repetition of arm to arm vaccination, which is rightly in the present day ruled out of court, I dispatched a weekly consignment of 200 lbs. of ice to Tenom and there instituted a lymph depôt. Installing the lymph safely at Tenom was not, however, a solution of the problem as the chief centres were at the following distances from it :—

Kaningau	30	miles.
Rundum	50	,,
Tambunan	70	,,
Ranau	120	,,

" In order to deliver the lymph to the vaccinator in good condition Thermos flasks were sent (previously experimented with in my own house) for its conveyance. The instructions were to wrap the required quantity of tubes in thick brown paper, to prevent breakage, place in the Thermos and then fill the flask with broken ice. This method has proved quite successful and the Resident reports ' the results continue to be excellent.' Our vaccinator misunderstanding orders, and evidently having no acquaintance with a Thermos, believed that the magic bottle itself contained the precious vaccine in an unusually liquid form and vaccinated 133 persons with *aqua pura* before discovering the real tubes of lymph at the bottom of the thermos." [p. 10.]

Straits Settlements.

The Straits Settlements Medical Report for the year 1915 estimates the total population of the Colony at 766,444. The Europeans numbered 8,086. Of the general population, the birthrate was 29·25 per mille, against 29·09 of the preceding year. The death rate was 29·15 against 34·13 of the previous year. The infantile death rate was 263·68 per mille of births.

The average number of European official residents was 322, with a percentage of death of 1·87.

Plague still appears in Singapore, but " the cases are of a sporadic nature distributed throughout the year occurring in various parts of the town, and with no discoverable sources of infection."

Deaths from beriberi have declined from 2,056 in 1911 to 1,079 in 1915. In Singapore 20,405 dollars were spent in drainage and minor anti-malarial works.

In the Pathological Department Dr. Keith carried out a series of blood examinations (Wassermann) for syphilis amongst the inmates of the Lunatic Asylum. Of 228 patients examined nearly 50 per cent. reacted positively.

The Bacteriological Laboratory, Kingston, Jamaica.

H. Catto, Acting Bacteriologist, Kingston, Jamaica, gives reasons for regarding the long vexed question as to the nature of vomiting sickness in Jamaica as definitely settled by the investigations of Dr. Scott* :—

" 1. The term ' Vomiting Sickness ' has been for many years used as a comprehensive name for various diseases, including cerebro-spinalmeningitis, gastritis, gastro-enteritis, worms, malaria, in fact, practically any disease occurring in the cooler months and associated with vomiting and convulsions.

" 2. During the last ten years opinions have been expressed to the effect that there is an affection called vomiting sickness whose course of symptoms and post-mortem changes are not those of any known disease.

" 3. The death-rate from this affection is exceedingly high, 80 per cent. to 90 per cent. and a fatal termination occurs in a few hours.

" 4. The first systematic investigation into the affection was undertaken by Captain (now Major) T. J. Potter, R.A.M.C., who came to the conclusion ' that the majority of deaths ascribed to the so-called vomiting sickness are due to ' Yellow Fever ' (1911).

" 5. To this succeeded the ' Meningitis era,' a recrudescence of the older idea that some cases at all events included under the term ' vomiting sickness ' died from cerebro-spinal meningitis.

" 6. Seidelin's investigation took place the following year (1913), but, though he was the first to give a detailed description of the morbid anatomy, he did not succeed in solving the question of causation.

" He showed however, that there was a definite unexplained condition comprising the majority of cases reported as vomiting sickness and that the condition was neither Yellow Fever nor Cerebro-spinal Meningitis.

" 7. Investigations into a typical and severe outbreak at Montego Bay in February, 1915, revealed the fact that in a majority of the cases in which a reliable history was obtainable ackees formed part of the last meal taken in health, and that this article of food could not be excluded in a single case.

" 8. Persons taking ' soup ' or ' pot-water ' made with ackees in certain conditions showed the most acute symptoms ; the onset occurred in two hours and death nearly always resulted.

" 9. ' Salt-fish,' a frequent article of diet, is in the country parts used as a euphemism for ' salt and ackee.'

" 10. Ackees under certain conditions are undoubtedly poisonous ; among such conditions are : (i) unopened ackees ; (ii) ackees picked from a decayed, bruised or broken branch ; (iii) ackees which have not opened naturally, but which have been forced open ; (iv) ackees with a soft spot in an otherwise apparently sound fruit.

" 11. Much of the poison is extracted by boiling with water." . . . .

" 19. Micro-organisms are rarely found in true vomiting sickness cases, and, when present are probably accidental and have no pathological significance.

" 20. Intragastric administration of an extract made by boiling unopened ackees with water produced in three kittens and one pup the symptoms and pathological changes seen in cases of vomiting sickness.

" 21. A case of ackee poisoning in a human subject exhibited the same symptoms, course, and post-mortem changes, macroscopical and microscopical, as (*a*) Human vomiting sickness cases, and (*b*) Animals to whom an aqueous extract of unopened ackees had been administered.

" 22. The characteristics of vomiting sickness, viz :—(i) Peculiar seasonal prevalence ; (ii) its confinement to Jamaica, so far as is known ; (iii) the sudden onset of symptoms in apparent good health, and in the well-nourished as in the emaciated ; (iv) the rapid and complete recovery of non-fatal cases ; (v) the affection of several members in one house or close

---

* Jamaica : Annual Report of the Superintending Medical Officer for the Year ended 31st March, 1916, pp. 46–47. Jamaica : Government Printing Office, Kingston.

neighbours in a settlement; (vi) the vastly greater preponderance in children; (vii) the absence of preference as regards sex; (viii) the rarity of occurrence in white children and in East Indians; (ix) the pathological changes induced; all find explanation in the view that the condition is an acute intoxication by unopened or unwholesome ackees—the fruit of Blighia Sapida."

The same authority refers to a form of polyneuritis which is found in Jamaica. He states:—

"I do not propose to give a description of the clinical signs and symptoms which are well known to all practitioners in Jamaica, but the opinion which I was able to form from my observations was that the condition at first sight appeared to be a multiple Peripheral Neuritis attacking chiefly the nerves of the lower extremities, but capable also of involving cranial and other nerves. It is obvious that those diseases which are known to be associated with a Polyneuritis, especially those occurring in the Tropics, would have to be eliminated before one can conclude that one is dealing with a definite clinical entity. . . ."

"In the Tropics, it is customary when a cause for a Peripheral Neuritis cannot be found, to attribute it to either Malaria or Syphilis. In order therefore to ascertain whether Malaria could be an aetiological factor, I examined the blood of each patient and the results are recorded in a table at the end of this report. No parasites were seen; there was no pigmentation of the leucocytes, no relative increase of the large mononuclears while evidences of anaemia such as nucleation and low haemoglobin content of the red blood corpuscles, polychromasia, basophilia, etc., were not encountered. Neither could any enlargement of the spleen be made out. In fact I could not convince myself that Chronic Malaria was in any way responsible for the Neuritis. It certainly was not associated with it. Similarly to eliminate an active syphilitic infection, a Wassermann test was carried out on the blood of each patient, and with one exception—viz., the case of (Ezekiel Douglas) who admitted that he had had Yaws when a boy, and who in addition had peculiar scars on both feet—all of the cases reacted negatively. . . ."

"It may not be amiss here to draw attention to an article by Dr. Percy Ashburn published in the proceedings of the Medical Association of the Isthmian Canal Zone, for the half-year October, 1914–March, 1915, in which he describes a form of Peripheral Neuritis, attacking youths and adults, endemic in Panama, frequently associated with Malaria and clinically indistinguishable from Beriberi, but occurring in persons who eat largely of beans, meat and fresh vegetables, and in many instances apparently independent of diet. Whether this Neuritis is the same as the one met with in Jamaica or even whether it is at all related to it, it is at present difficult to say, as a pathology in the two conditions has not yet been satisfactorily worked out. Meanwhile his remarks that decreasing wind and increasing rainfall bear a time relationship to the rise of the disease, while the occurrence of stegomyia mosquitoes and of house flies may bear a place relationship, suggest that he recognizes the possibility of a micro-organism being the etiological factor." [p. 48–49.]

Trinidad and Tobago.

Surgeon-General H. L. Clare in his Medical Report for 1915 gives in concise form considerable information as to medical and sanitary conditions in the colony*:—

* Trinidad and Tobago. Medical Report of the Surgeon-General for the Nine Months ended the 31st December, 1915. Council Paoer No. 133 of 1916, p. 6.

"The population of the Colony estimated by the Registrar-General to the middle of the nine months' period ended 31st December 1915, is 361,811 and on this estimate the following birth and death-rates for the nine months are computed :—

Birth-rate	31·52	
Death-rate (Crude)	21·26	
Natural increase of population (registered births over deaths)		2,796
Number of deaths of children under one year ..		1,334
Number of still births registered		701
Infant mortality rate	155·28	

"The principal causes of Death are shown in the following Table which also displays the death-rate from each cause per 1,000 living :—

Cause of Death.	*Number.*	*Death-rate per 1,000 living.*
Malaria	479	1·73
Tuberculosis (all forms)	412	1·5
,, Pulmonary	371	1·36
Bronchitis and Broncho-Pneumonia ..	359	1·32
Pneumonia	180	0·66
Cardiac Diseases	172	0·63
Dysentery	361	1·32
Diarrhoea and Enteritis	710	2·6
Enteric Fever	121	0·44
Ankylostomiasis	159	0·58
Old Age	309	1·13

"The general health of the Colony as disclosed by the reports of the District Medical Officer was on the whole satisfactory, with some excess of malaria in certain districts which is attributed to increased rainfall in the latter part of the period. With the exception of four District Medical Officers who record a few cases of the Malignant type of Malaria all the others report the disease to be of the mild or benign tertian variety. There was no unusual prevalence of endemic disease with the exception of small outbreaks of dysentery in the Bocas and Arima Districts which were soon controlled ; in the Colony generally there was a decrease in the usual incidence of dysentery which also was of a less virulent form. Enteric fever prevails in an increasing degree nearly all over the Colony ; there were 160 cases and 121 deaths (a very high proportion) brought to notice within the nine months yielding a death-rate of 0·4 per 1,000 living. This disease remains unnotifiable, and the observations under this head in my Annual Report for 1914–15 apply again with increased force. The Colony was happily free from any case of Plague or Yellow Fever during the nine months. I regret to say that there is no change to record in the Tuberculosis situation in the Colony.

"The campaign against Ankylostomiasis is still pursued with vigour and achieves I think excellent and permanent success ; monthly progress reports of the operations have been submitted regularly."

St. Vincent.

In the Annual Report for 1914–15, the medical officer No. 4 District, St. Vincent, states that, compared with the preceding year, the birth-rate had diminished 15 per cent., and that the death-rate had increased nearly 50 per cent.

As regards general sanitary conditions, he holds that "the villages in the district have been periodically kept clean. Nothing untoward seems to have arisen to give rise to extraordinary sanitary measures." He, however, makes the following remarks on syphilis and tuberculosis, as causes of mortality* :—

"*Syphilis* contributed 23 per cent. towards the total mortality for the year, and *infantile diarrhoea* claimed 22 per cent. of the victims. These two affections apparently work hand and hand and between them account for no less than 45 per cent. of the number of deaths recorded for the year. Congenital syphilis enjoys a high rate of incidence among the children of this district. The trouble is aggravated by ignorance and negligence on the part of the parents, injudicious feeding and internal parasites. The infants of this district come into the world to combat a series of evils which work their way among these helpless beings with unrelenting vigour. Not less than 75 per cent. of the children from 3 to 10 years of age, who appear at the dispensary, presumably for worm powders, bear the impress of the strange and stern discipline which they have had to undergo, in making a fair bid for life. The lymphatic glands in the groin, neck and epitrochear regions, which remain discrete and in a chronic state of enlargement bear testimony to the winners of the race in the desperate struggle for survival. The high infantile mortality shows the heavy toll which is paid in this strife. . . .

"*Pulmonary Tuberculosis.* 31 cases and 12 deaths are on record for the year, a mortality of about 40 per cent. It is regrettable that Tuberculosis is a disease destined to spread among the poorer classes. Tit-bits prepared to fillip the appetite of the dying are passed on, tasted and inoculated, to the less fortunate members of the household. Bedding and wearing apparel, far from being consumed in some devouring flame, are coveted as an heritage. Such is the gloomy picture which confronts the student of preventive medicine in these damp, stuffy, overcrowded, ill-ventilated rooms with their low thatched ceilings."

The Report on the Kingstown Colonial Hospital for the same period, by Dr. Cyril H. DURANT, gives further testimony to the important place syphilis holds as a mortality factor on the island. Of a total of 970 admissions of in-patients 14 per cent. were due to syphilis. There were four deaths due to this disease. In addition, in the out-patient department, there were 126 cases of the tertiary form treated with nine deaths.

PANAMA CANAL ZONE.

With victory gained in Panama, Surgeon-General GORGAS' successors must still be on the watch that retrogression does not occur. The Report of the Department of Health of the Panama Canal for the month of September, 1916, shows that there has been continuous progress. In a strength 33,528, the constantly non-effective rate per mille was 8·88, as compared with 10·35 for the corresponding month of the preceding year. Under malaria, the admission rate for both hospitals and quarters was 13·95, as compared with 53·41 for September 1916.

The following note records practical observations of value :—

"The several districts of the zone are in good sanitary condition, and the beneficial results of the permanent work—consisting of concreting

* Saint Vincent : Report of the Medical Officer, Kingstown, for the Year 1914–15. p. 18.

ditches and installing tile drains—during the past dry season is manifest. The heavy rains have made it possible to determine where additional drains are required and the laying of tile is in progress in all the districts. Hydraulic fills are being made at Paraiso, and in the flats between Ancon and Corozal.

"The hydraulic fill immediately north of the Balboa railroad station, which was made two years ago, has given very little trouble from breeding mosquitoes until recently. Experience of past years has been repeated in connection with this fill; with the appearance of vegetation of the fill, both culex and anopheles have been found and the area now requires careful attention.

"As noted under 'Vital Statistics,' the malaria rate has been reduced about one-half as compared with last year.

"A number of cases of dengue have appeared at the military posts on the west side of the canal. In connection with the transmission of dengue by *Culex fatigans*, it is interesting to note in this connection the following figures showing the number of mosquitoes caught in barracks at the several posts during the month.

	Culex caught.	Total number caught.
Camp Otis	37	5,992
Camp at Empire	4	743
Camp Gaillard	29	4,903

"The number of anopheles caught are in all cases less than the number of culex, and almost the entire catch at all of these posts consist of mansonia. If the continued appearance of cases of dengue in this vicinity affords an opportunity to do so, it is proposed to take steps to determine whether mansonia are transmitting dengue." [p. 10.]

[Yquitos, Peru.

*The town of Yquitos, on the River Amazon, is in Peruvian territory, and is the natural terminus of the most important steamer traffic on that river. It is a town of about 12,000 inhabitants, and until the year 1912 was in the most deplorable sanitary condition; the annual mortality amounting to 40 per thousand. Within the last four years, however, the sanitation of the town has been energetically taken in hand by the Prefect, Colonel Puente, and his sanitary adviser, Dr. Converse, the latter a United States graduate, and a pupil of General Gorgas of Panama fame. The result has been that within a year the mortality, for 1913, dropped to 28·88 per thousand, and, for the first six months of 1914, to 21 per thousand. The principal diseases to be combated were yellow fever, malaria, ankylostomiasis, beriberi, liver complaints and disorders of the alimentary canal. The town was full of the usual open drains, into which the inhabitants emptied their rubbish, while the habit of relieving the calls of nature out of doors, wherever there was the concealment of vegetation, polluted the whole soil. Energetic measures of the usual kind were taken to destroy the

*Roméro (Oscar Luiz). Saneamento de Yquitos. [Sanitary Improvements at Yquitos.]—*Brazil Med.*, 1916, Jan. 22, Vol. 30, No. 4, pp. 28-31. Summarised by Dr. J. B. Nias.

breeding places of mosquitoes, principally Stegomyia and Mansonia, and a systematic plan for canalizing the drains of the whole town was simultaneously put in hand. Unfortunately, the water-supply for domestic purposes in Yquitos, up to the present, seems to consist exclusively of rainwater, which has to be collected in the usual receptacles, with all their attendant dangers. The work of improvement, however, is still in progress, according to the writer of the present paper.

The Influence of Ventilation and Heating of Rooms on Health.

According to the first Report issued by the New York State Commission on Ventilation* the following results have, so far, been obtained. As the Commission has not finished its work, their conclusions may in future require modification.

"1. A very high room temperature such as 86° F. with 80 per cent. relative humidity, produces slight, but distinct elevation of body temperature, an increase in reclining heart rate, an increase in the excess of standing over reclining heart rate, a very slight lowering of systolic blood pressure, and a marked fall in the Crampton value.

"2. A moderately high room temperature, 75° with 50 per cent. relative humidity, has all the effects noted above although of course in less degree than the extreme temperature condition.

"3. Even the extreme room temperature of 86° with 80 per cent. relative humidity shows no effect upon rate of respiration, dead space in the lungs, acidosis of the blood, dissociation of oxyhaemoglobin, respiratory quotient, rate of heat production, rate of digestion, carbohydrate or protein metabolism, concentration of the urine and skin sensitivity.

"4. The power to do either mental or physical work, measured by the quantity and quality of the product by subjects doing their utmost, is not at all diminished by a room temperature of 86° with 80 per cent. relative humidity.

"5. On the other hand the inclination to do physical work, and the inclination to do mental work are diminished by sufficiently high room temperatures. So far as physical work is concerned our tests show a decrease in actual work performed, when the subject had a choice between working or not working, of 15 per cent. under the 75° condition and of 37 per cent. under the 86° condition, as compared in each case with 68°.

"6. Stagnant air at the same temperature as fresh air, even when it contains 20 or more parts of carbon dioxide and all the organic and other substances in the breathed air of occupied rooms, has, so far, shown no effect on any of the physiological responses listed above under 1 and 3 nor on the power or inclination to do physical or mental work nor on the sensations of comfort of the subjects breathing it.

"7. On the other hand the appetite for food of subjects exposed to such stagnant air may be slightly reduced.

"8. These experiments seem to indicate that overheated rooms are not only uncomfortable but produce well-marked effects upon the heat regulating and circulatory systems of the body and materially reduce the inclination of occupants to do physical work. The most important effects of 'bad air' are due to its high temperature, and the effects of even a slightly elevated room temperature such as 75° are sufficiently clear and important to warrant careful precautions against over-heating.

"9. The chemical changes in the breathed air of occupied rooms are of comparatively minor importance although the substances present in such air may exert a slight decrease in the appetite for food."

---

* American Journal of Public Health, 1915, Feb., Vol. 5, No. 2, pp. 85–118.

DISEASE PREVENTION.

Malaria.

Anti-Malaria Measures in British Guiana.

The Report of the Surgeon-General for 1915 gives proof of the financial saving in labour and the saving of life following routine sanitary measures. Surgeon-General Wise states :—

" Efforts have been made to introduce the systematic use of quinine into the schools. This measure is now adopted in 95 schools. The total number of schools in the colony is about 230 in number.

" Specially malarious districts have been selected for this distribution in preference to others. Both Managers and Head Teachers have frequently given expression to the obvious benefit which results.

" Much has been done on sugar estates towards eliminating the periodic epidemic of malaria. These measures consist mainly in careful drainage in the yards with constant prophylactic use of quinine supplied free for the labourers. This excellent work is however limited to the yards proper and does not extend to the pasture lands which are gradually increasing in population, and in which occur the greater number of malarial deaths on the estates.

" This table shows the spleen rate of children on the estates in various districts since 1911. [pp. 18-19.]

(1) Districts.	(2) 1911.	(3) 1912.	(4) 1913.	(5) 1914.	(6) 1915.
Demerara :—					
East Bank	13	7	4	7	5
West Bank	39	25	18	12	15
East Coast	18	5	5	5	9
West Coast	24	9	4	4	9
Berbice :—					
Canje	20	..	7	2	3
East Bank	42	33	24	9	10
Corentyne	10	2	1	..	1
West Bank and West Coast	26	11	6	2	2
Essequebo	47	15	10	6	7

" The number of deaths from malaria in Estates' hospitals is as follows :—

1906–07 to 1910–11 per year	210
1911–1912	167
1912–1913	66
1913–1914	60
1914–1915	65
1915 (nine months)	78 "

" The prophylactic use of quinine has produced a marked improvement in the incidence of Malaria Fever.

Year.	Cases.
1909–10	241
1910–11	113
1911–12	52
1912–13	25
1913–14	25
1914–15	42
1915 (nine months)	6

" These six cases which were all mild ones were treated in hospital." [p. 9.]

Anti-Malarial Drainage in India.

The Indian Irrigation Committee* has placed on record that India, in the past, appreciated the necessity of drainage as an anti-malarial measure. In discussing conditions in the United Provinces of Agra and Oudh, it is stated :—

"It cannot however be said that the canals in the United Provinces have always conferred unmixed benefits upon every tract which they command. In many places, their introduction led to a gradual but steady rise of the level of the subsoil water, and resulted eventually in water-logging of the soil, the increase of malaria, and the further deterioration of *usar* or *reh* covered tracts. To remedy these evils and to prevent further injury, it was found necessary to incur a considerable outlay on the re-alignment of some of the older channels, and on the construction of a large system of drainage channels, the aggregate length of which now amounts to 3,327 miles, or to more than one-third of the total length of the canals and their distributory channels. On the construction of the drains an expenditure of about 43 lakhs† has been incurred. These measures have gone far to remedy, if they have not entirely removed, the evils of which there were various complaints in past years."

Malaria and Irrigation.

One of the most baneful errors of the uneducated tropical agriculturist is that the more water he is able, by means fair or dubious, to secure for his land the better will be the crop. Under this method, the aeration of soil and deterioration of crops is involved ; puddles and, with them, the chances of suitable breeding places for anophelines being increased, the natural sequel is malaria with its deteriorating influence on the agriculturist. A vicious circle is formed.

In finding a happy mean between wasteful and useful employment of water, the Agricultural Research Institute of Pusa continues to do work that is destined to be of vast importance in the agricultural, financial and sanitary interests of India, and the Tropics generally. The following is from a Review of the Report of that Institute for 1915 and 16 by "Indian Engineering (Calcutta)."‡

"In connection with the growing of wheat in India a question of the very first importance is being investigated at Quetta ; and this is if it cannot be matured with a greatly reduced supply of irrigation water. Experiments have already established the following five principles : —(1) The irrigation water available must be spread over the largest possible area ; (2) heavy waterings reduce the proportion of grain to total crop ; (3) the growth period of wheat is increased by heavy waterings ; (4) when the water supply is limited, the root development of the wheat crop must be deep ; (5) the soil moisture must be preserved, as far as possible, by a surface mulch of dry soil. By advice of the officers of the Experiment Station Zemindars have, by giving only a single watering before sowing instead of six waterings after sowing as was their practice, been able to produce over 22½ maunds of grain (in addition to 43¾ maunds of bhusa) per acre instead of their former average of 13 maunds. Should this principle prove to be of general application the saving of irrigation water in the wheat tracts of India will be enormous ; there will moreover be a general improvement of the soil, less water logging and less fever."

---

* p. 185. Part I to IV.

† One lakh = £6,666.

‡ Indian Engineering (Calcutta), 1916, Nov. 18, Vol. 60, No. 21, p. 323.

The Sympathy of Agriculture with Anti-Malaria Interests.

That water logging of soil should no more be tolerated in the agricultural than in the anti-malarial interests of an area is evident from the following extract from "Soil Erosion and Surface Drainage," by Albert Howard, C.I.E., M.A., Imperial Economic Botanist.*

"Many of the soils of the Indio-Gangetic plain belong to the category of silt-like soils and are particularly liable to the destruction of their porosity by heavy rainfall or surface flooding. The pore spaces of the soil become filled with water, air is expelled and the particles slip into a position of closer packing. . . .

"The occurrence of slight water-logging can only be detected by a trained observer, who has learnt how to read his practice in the plant. The production of swamps, on the other hand, is of course obvious to all, but between these two extremes a vast amount of damage to crop production is being done every year which is only very dimly understood at the present time.

"One of the best methods of detecting the occurrence of water-logging is a close observation of the growing crop. One of the first things to be noticed, in cases where the porosity of the soil has been destroyed, is a slowing down in growth and the production of yellowish foliage. This is often exceedingly unhealthy in appearance, and, if the roots are entirely deprived of air, as is sometimes the case during the monsoon, a diseased condition, described as wilt, ensues and the plants finally die outright. . . . The foliage is thin and yellow, the growth poor and the root system badly developed and near the surface. Such crops never stand the advent of the hot season but dry up quickly, although there is abundant moisture in the subsoil. They starve in the midst of plenty, on account of the fact that they do not root deeply, and therefore cannot make use of the subsoil moisture. This result follows from the want of aeration in the subsoil of such water-logged lands and to the fact that the roots cannot breathe for want of a proper supply of oxygen gas.

"The damage done to crops by water-logging seems to be due to two main causes—lack of aeration and the destruction of nitrates. If the soil is not ventilated properly, a full supply of oxygen does not find its way into the ground for the use of the roots and soil organisms and the carbon dioxide, which is formed in the soil in large quantities, cannot escape into the atmosphere. The result is that crop production is limited—directly by the want of air and indirectly by the inhibiting effect of the accumulation of carbon dioxide. Besides these effects, water-logging, if continued for some time, leads to the destruction of available nitrogen in the soil."

St. Vincent.

Dr. C. A. Hughes, Medical Officer, No. 2 District, Kingstown, considers that "a very important factor influencing the comparative scarcity of the disease (malaria) in St. Vincent is the porosity of the soil. This with improved sanitary inspection and an increased area of cultivated land is responsible for the fewer cases met with."†

* Agricultural Research Institute, Pusa, Bulletin No. 53, 1915, pp. 7 & 8.
† St. Vincent. Report on the Colonial Hospital for the Year 1913-14.

Malaria in Sanitary Administration.

The *Transactions of the Society of Tropical Medicine and Hygiene* for the month of November, 1916 (Vol. 10, No. 1, pp. 1–15) contained an article by Dr. MACDONALD of a sound practical nature, on the principles which should be followed in sanitary organization in the Tropics. To this is added a discussion of methods of malaria eradication.

In respect to organization he states :—

"The staff of the health department in its simplest should consist of a Medical Officer of Health specially trained in practical sanitation, holding a degree in science or a diploma in public health, and of necessity in the tropics holding also a diploma in tropical medicine ; sanitary inspectors, clerical staff, and labourers.

"The number of Sanitary Inspectors depends on the population. For a unit—rural or urban—of 60,000 population, ten sanitary inspectors is a reasonable number. This population represents some 10,000 (urban) to 12,000 (rural) dwellings, and with ten inspectors it should be possible for each premises to be visited and reported on in routine once every three months, or four times a year.

"I contend that the value of all public health administration is to be summed up in its domestic inspection and education ; and, to get any control over that, the routine visitation is an absolute essential." . . .

"Of the ten sanitary inspectors the health officer will select his men for duties in which they display special aptitude. In general it will probably be found best simply to give them districts in which they have the entire control of all sanitary measures, and to select men for special duty as occasion dictates.

"A superior inspector may be chosen as a chief sanitary inspector specially trained or not, but the health officer in any case, if he desires work done, will have to go down to his inspectors individually, go over their records with them, and systematically review their work in the field. *Sic itur ad astra*—only thus. If the health officer expects to control the disease conditions in a tropical community only by plotting curves and pulling strings at his office desk, he had better not attempt work in the tropics. He must see things done." . . .

"A labouring staff is inevitable in a tropical health department. In the city the scavenging rightly is an important section of the health department. The necessary carts, horses, mules, motor-vans, and all the paraphernalia of tropical scavenging will come under the direct purview of the health office. The manner of their economic engagement will be a matter for the interested authority. Their entire control during working hours will be under the medical officer." . . .

"On the labourer, strange as it may seem, depends the value of the ordinary antimalarial measures in an urban or rural tropical community. An average of a labourer per mile of streets, lanes, gullies and roads may be set down as a fair indication of the necessities of scavenging, street cleaning, gully training, gutter sweeping, and the various odds and ends of practical sanitation in a city. On the co-operation of the whole population depends the value of special antimosquito work, the suppression of Culex and Stegomyia, and sometimes of Anopheles.

"In a purely rural community, outside towns, organised control of roadside gutters and other temporary breeding pools may be obtained by having a labourer roughly to five miles of roadway."

After inviting attention to the recognized anti-malaria measures, he suggests "inquiry into the gross relativity between the quinine consumed in any community and the incidence of blackwater fever." But in respect to quinine he holds

"that *quinine has no position in sanitary administration* ; and I *contend that the facile relief from malaria attacks by the taking of quinine, the consequent apotheosis of quinine in the hands of the medical officer and in the*

minds of the people, the easy glory of cheap quinine administration by governments, have disastrously postponed sanitary administration in the tropics, and prolonged personal misery and economic inefficiency." [Italics in original.]

Larvicides.

The Report of the Agricultural Research Institute and College at Pusa (p. 76) during 1914–15 describes the following experiments as to larvicides :—

"With a view to determining the influence of local waters on mosquito-breeding, experiments were made on the effect of equimolecular salt solutions on the larvae. The results were of interest as indicating that an unexpectedly high percentage of lime in water is to some species distinctly beneficial."

Blackwater Fever.

The following observations as to blackwater fever would support the opinion that whether this be but an aggravated form of malarial fever or a separate entity, at least it falls in frequency before the advance of anti-malarial measures* :—

"There can be no question but that the greater attention now devoted to malaria prophylaxis accounts for this comparatively low incidence of blackwater fever, the average liability to which among Europeans is now about 1 per cent.

"Just 20 years ago Sir Harry Johnston appended the following note to the Annual Medical Report of the Protectorate, which is of much interest in this connection :—

"The death-rate amongst Europeans rose from a former death-rate of 6·5 per cent. to 9·7 per cent. The number of deaths registered was 28, out of an average European population of 275.

"Of these deaths 20 were due to the various forms of malarial fever (including blackwater). . . . Out of the 20 deaths from malarial fever about 16 were cases of blackwater. Besides these 16 cases there were as many more where recovery took place.'

"So that in the year 1895 there were about 32 cases of blackwater fever in a population of 275, making the liability about 11·6 per cent. fifteen years ago."

The following extracts from the Annual Medical and Sanitary Report for Nigeria 1914 support the same opinion :—

"*Decline in number of cases and its cause.*—Whatever the cause of the steady decline in the number of blackwater fever cases with its heavy case mortality (25 per cent. in Europeans and 50 per cent. in natives in 1914), it is very gratifying to record that, like malaria, rapid progress is being made in its reduction.

"There can be little doubt that the dissemination of useful information to the layman as to how he should live on the Coast, the more regular use of quinine, and the general improvement in the sanitary condition of stations have largely contributed to the decline." . . . [p. 69.]

"It is interesting to note that of six blood films, examined at Yaba, three of which were taken during the first twenty-four hours of the disease, malaria parasites were found in all three. Of films examined which were taken later than the first day parasites were not found ; strong support for the contention of many authorities that malaria parasites can be found

* Nyasaland Protectorate. Annual Medical Report on the Health and Sanitary Condition for the Year ended 31st December, 1914, p. 12.

in all cases of blackwater fever during the first twenty-four hours if an exhaustive search is made for them. A thorough examination of the cases is often, however, not possible for the Medical Officer in the bush, where many cases occur, and he does not always have the opportunity of seeing the case during the first twenty-four hours." [p. 94.]

Sleeping Sickness.

Precautionary measures against trypanosomiasis as carried out during 1915 are thus described in the Annual Medical and Sanitary Report for Nigeria, by Dr. M. Cameron Blair, the Senior Sanitary Officer :—

"During the rainy season the fronts of many of the riparian villages in the Province of Muri were kept entirely cleared; and the danger of the villagers being attended by tsetse-flies, during their movements to and from the necessary water, was thus materially diminished. The opening up of trunk roads and the maintenance of existing ones, mentioned above, was very substantial progress, considering the narrowness of the means, financial and personal, available for the purpose. In this connection, the work maintained in the backward provinces of Bassa and of Muri is especially worthy of mention. . . .

"No case of this disease was recorded in a European during the year, although the river Benue had been used extensively for passenger transport. One of the European victims, reported the previous year, returned to duty convalescent.

"The vessels used for passenger transport were all fitted with more or less effective wire gauze shelters. . . .

"Clearing operations are always being effected in tsetse belts, so far as funds and other means will allow; where there are alternative routes, the use of those traversing fly-belts is consistently discouraged; constant efforts—increasingly successful—are being made to induce Natives permanently to desert foci of sleeping sickness; and Government is gradually adopting the policy of refusing to permit Europeans to settle in regions from which it is trying to induce the indigenous natives to depart.

"But it must be remembered that operations against trypanosomiasis are a constant war, in which the enemy is apt, unexpectedly, to change his venue from time to time." [pp. 11, 14, 15.]

Yaws.

Dr. J. M. G. Ewing, Medical Officer, District No. 1, Kingstown, St. Vincent, considers that more sanitary effort is necessary in the suppression of yaws. He states* :—

"Recurrences or fresh infections do occur after treatment by "606," and it is now recognised that salvarsan is not the infallible remedy it was, like every new drug, at one time claimed to be; still the results are, I think, excellent, and it is the best drug we can employ.

"Hospital treatment is however, not sufficient; infected houses ought to be purified to prevent the spread of the disease, and cured patients ought to be able to return to clean homes. The infected houses ought to be fumigated, and if funds were available, every case of Yaws should be reported to the Sanitary Authority, the Medical Officer receiving a fee for the notification; old clothing and articles of little or no value should be burned, and if not, fumigated, the house at least ought to be white-washed, and scrubbed, and purified in a domestic manner.

"In this way we might hope to eradicate the disease entirely in time."

* St. Vincent. Report on the Colonial Hospital for the Year 1913–14.

Venereal Disease.

To meet the requirement of not breaking a day's labour to secure medical treatment, is certainly a desideratum of great import in prevention of spread of venereal disease. This highly practical point has been met in New South Wales by the opening of so-called "night clinics." The Director-General of Public Health (Dr. Robert Paton) in his Rport for 1914 thus describes their *raison d'être* :—

"During the last two or three years more than usual attention has been devoted here to the subject of venereal diseases with the object of making available adequate and easily accessible avenues of treatment, as it is more and more realised that this is the only method by which persons affected can themselves be secured from the more disastrous effects of these diseases, and other persons be protected from contracting infection.

"The first Night Clinic was opened at the Department's Hospital Admission Depôt in July, 1914, and did excellent work; one night a week being devoted to men and another to women patients.

"Later on a Night Clinic for venereal diseases was opened at the Royal Prince Alfred Hospital, where greater facilities for treatment could be provided. This clinic proved a remarkable success in dealing with the disease, the number of persons treated amply demonstrating the absolute necessity which existed for taking special steps in this direction. The attendances at this clinic exceeded those of any other out-patient department at the hospital." [pp. 7 and 8.]

Yellow Fever.

The following Resolution appeared in the Calcutta Gazette on the 23rd November, 1916 :—

"The question of the measures to be taken to prevent the introduction of yellow fever into the Port of Calcutta through the medium of the stegomyia mosquito in consequence of the opening of the Panama Canal has recently been under the consideration of Government. The Government of Bengal are advised that an essential preliminary to any scheme of anti-stegomyia work is to secure effective sanitary organization in the Port area. At present there are a number of independent authorities having sanitary jurisdiction in the Port area, whereas it appears desirable that measures for the reduction of the stegomyia mosquito should be under the supervision of one controlling authority. It also appears that the legal powers of these bodies in respect of sanitation are insufficient for the measures required for an anti-stegomyia campaign.

"In these circumstances the Governor in Council has decided, on the recommendation of the Sanitary Commissioner, to convene a conference representing the different bodies concerned to consider the measures necessary to establish homogeneous sanitary control throughout the Port area, with special reference to the action which should be taken to ensure the security of the Port from yellow fever. The conference will be constituted as follows :—

"Chairman :—Mr. C. J. Stevenson-Moore, C.V.O., I.C.S.

"Members :—The Surgeon-General with the Government of Bengal; the Vice-Chairman, Port Commissioners; the Chairman or a representative of the Calcutta Corporation; the Chairman or a representative of the Howrah Municipality; the Chairman or a representative of the Cossipore-Chitpore Municipality; the Chairman or a representative of the Garden Reach Municipality; the Chairman or a representative of the Budge-Budge Municipality; the Health Officer of the Calcutta Corporation; the Port Health Officer.

"Secretary :—The Sanitary Commissioner, Bengal."

Dysentery.

In the Annual Medical and Sanitary Report for Nigeria for 1914, the following suggestions as to transmission of dysentery occur :—

"Sixty-six Europeans and 747 natives were treated for this disease, and 130 of the natives died.

"These figures show a very material increase on those of the previous year.

"It is easy to account for the increase among the natives. The native cases were largely drawn from labour camps, where the sufferers were brought under medical notice; while until the harvest had been gathered in and normal plenty had thus been restored after the scarcity mentioned above, many suffering and starving natives had been aggravating their intestinal ailments by eating crude raw grain.

"It is difficult to explain the increase among the Europeans; but it is a fair inference that, when an increase of native cases occurs, infection must be more widely disseminated. Now Europeans eat salads; when infection is more widely disseminated, salads are more liable to be dangerous; and there can be little doubt that the majority of Europeans affected acquire the infection from this source. This renders attempts at stamping out the disease, among Europeans, rather hopeless; for, as mentioned in a former report, to ask the average Englishman to give up salads is to ask too much of his form of human nature.

"All available care is taken to safeguard water supplies, and education touching water-borne diseases is continually offered to the natives—successfully in some cases only." [p. 20.]

Under the favourable conditions of food scarcity the opportunities of spread of dysentery are so great, and the susceptibility of subjects so increased that the term "famine dysentery" is familiar, as describing the mixed conditions resulting. Doubtless in referring to "education touching water-borne diseases" amongst natives, the reporting officer does not imply that more than one of the causes of transmission could thus be met; but his reference to the Englishman's determination to eat salads in the tropics (presumably of other than absolutely known origin) would point to both education and common prudence being deficient in the white man who offers to first remove the mote from his coloured neighbour's eye. As a saving point in such supposition, however, it is to be noted that the water-borne origin of dysentery is supported in the case of Europeans, by the statement that the "large percentage were men constantly travelling and consequently unable to obtain always a supply of the sterilized water obtainable at the majority of the larger stations." If this be the cause, one must imagine the climate is exceedingly enervating. The boiling of water is not a difficult act, and actual "sterilization" need not be required to get rid of ordinary water-borne diseases.

Plague.

Rats and Plague.

In Part II. of the New South Wales Report for 1914, the following is an extract from a contribution "Researches on Plague," by Drs. J. B. Cleland and E. W. Ferguson.

"In the first epidemic of plague at Sydney in 1900 and 1902 no record was kept of the actual number of each of the two species of rats—*Mus decumanus* and *Mus rattus*—prevalent, but in the whole collection of 215,286 destroyed there were about as many of one as of the other. *Mus rattus* predominated among those taken along the shores, and *Mus decumanus* among those taken inland. Among those selected for examination the infected specimens were all *Mus decumanus*." [p. 175.]

A total of 82,000 rats was examined for plague infection between 1903 and 1914. Of these 30·31 per cent. were identified as *M. decumanus* and 34·22 as *M. rattus*. The figures in the following Table, showing the relative percentage infected of the two species of rats at different periods should be of interest to epidemiologists.

Year.	Period of Rat Examination.	Percentage of infected to total Examined.		
		Decumanus.	*Rattus.*	*Musculus.*
1903 ..	1st May to 15th Aug.	..	..	..
1904 ..	1st Mar. to 3rd Dec.	·76	1·16	0·26
1905 ..	Year	·79	·88	·13
1906 ..	,,	·49	1·02	·34
1907 ..	,,	·66	1·3	·15
1908 ..	,,	1·075	·84	·14
1909 ..	,,	·32	1·22	2·06
1910 ..	,,	·07	·009	..
		·64	0·88	·19

The Rat and Plague Spread.

In the Annual Report (Jamaica) of the Superintending Medical Officer for 1916, J. Errington Ker, the Chairman, Quarantine Board, draws attention to an interesting instance of a long travelled plague carrier* :—

"The following extract is taken from the United States Public Health Report, Volume 31, Number 19, May 12th, 1916, and is worth recording :—

Louisiana, New Orleans, Plague eradication.
Plague Rat.
Case No. 287.
Address S. S. Trevelyan from Karachi, India and Newcastle, England.
Captured April 7th, 1916.
Diagnosis confirmed April 22nd, 1916.
Treatment of ship—Deratization by fumigation.
Plague rats confirmed—1.

"(The same Health Report states that between November 7th and 20th there were two cases of human plague at Karachi and two deaths).

"From the above it would appear that the steamship Trevelyan sailed from Karachi, India, a plague-infected Port and that she called at Newcastle, where presumably she discharged and took on cargo, that she then sailed from Newcastle to New Orleans where on investigation a Plague-infected rat was found on board her. No mention is made of any human plague having occurred on board.

"This case seems to indicate firstly: that plague among rats may exist on board a ship and that the said ship may go from port to port carrying its plague-infected rats with it; and secondly, that a ship may go a very long distance with rat plague on board, in fact may travel for several weeks in such condition without of necessity any person on board becoming infected.

"One takes it for granted that Newcastle is free from rat plague.

"One often hears it stated that it is very absurd to disinfect a ship that has come from an Indian or other port where plague exists if such ship has since leaving such above port called at an English port (possibly having discharged and taken on cargo). The above case would seem to show that one cannot be too careful with a ship that has been to a plague-infected port and which ship has not been disinfected since calling at such port, although she may have called at a port in another country since leaving the plague-infected port."

* Jamaica. Annual Report of the Superintending Medical Officer for the Year ended 31st March, 1916. Jamaica: Government Printing Office, Kingston, p. 38.

Plague and Head-lice.

Dr. O. L. E. De Raadt makes the following statement* :—

"Head-lice were obtained by combing the luxuriant hair of a female plague patient; these parasites were afterwards rubbed fine in a mortar with physiological salt-solution, and with this mixture rodents were inoculated, both subcutaneously and cutaneously. By collecting the head-lice exclusively from the corpses of plague patients and not from living patients, the chances for positive results were made as great as possible, because in cases of bubonic plague, an intense bacteriaemia generally develops in the later stages of the disease." . . .

"Of five inoculation experiments, 100 per cent. were positive.

"This proves that head-lice which have sucked the blood of plague-patients, have absorbed the plague virus, and must consequently be considered capable of transmitting the disease from one person to another."†

Undulant Fever.

In the Report of the Public Health Department of Malta for 1915-16, evidence of the necessity for continued vigilance as to the incidence of the disease is noted by J. Caruana Scicluna :—

"Concurrently with an increase in the number of goats infected with the specific micrococcus there was a recrudescence of undulant fever amongst the civil population. The number of cases notified was 473 against 321 in the preceding year, the percentage of deaths however was very small, viz., 6·3 per 100 cases. Most of the notifications referred to attacks in the urban and suburban areas; in the rural Zeitun and Tarxien were the most affected.

"In general the connection of areas yielding the greatest proportion of infection in goats with the inhabited centres where undulant fever is more prevalent is borne out year after year by the study of the incidence of the disease.

"Of 6,630 goats and 983 sheep examined 598 and 10 respectively were found infected, the proportion being 9 per cent. for goats and 1 per cent. for sheep." [p. 2.]

Typhoid.

Jamaica.

At p. 9 of the Report of the Central Board of Health, Jamaica, 1916, Dr. Oliver Crosswell makes the following remarks as to the prevalence of typhoid fever in Kingston :—

"There were 48 of such notifications [cases admitted from outside the parish] for 1915, and 66 for 1914; this would reduce the cases having origin in Kingston to 205 for 1915, which would naturally materially reduce the incidence rate for Kingston proper.

"With regard to the causes of the prevalence of this disease, I have nothing to add, the matter having been exhaustively dealt with by Drs. A. MacDonald and Turton in their valuable report on Typhoid Fever in 1911. I cannot however minimise the danger from flies and foul pit closets, many of the latter being no doubt active laboratories for the breeding, growth and dissemination of the germs of the disease. It is unnecessary for me to labour the *relative connection between the fly and the pit-closet* on the one hand, and the *fly and the food of the people*, on the other hand.

---

* Mededeelingen van den Burgerlijken Geneeskundigen Dienst in Nederlandsch-Indië., 1915, Vol. 4, pp. 39–40.

† Certain races kill head-lice by smashing them against the scalp of the bearer. Scratching of the head from irritation of lice is frequent.

"'*The Carrier*,' as a cause of infection, may be responsible here and there for a certain number of cases; but I do not believe that the proportion would bear any comparison with the number of cases due to fly and food infection; and this leads one up to a consideration of the advisability of using *Anti-Typhoid Inoculation* as a preventive measure, for our school children, hospital attendants, and others of the general public who would be willing to submit to inoculation. In a paper read before the Medical Officers of Health Society of Jamaica, last year, I made a suggestion that Inoculation as a preventive measure having been found to render immunity to troops inoculated against Typhoid, the measure might well be tried in the schools with the children. It is a measure that would not run into any great sum of money, and may be expected to have as great a benefit as it has proved to the troops in this campaign. It is worth a trial.

"In the United States of America it has become fashionable for large numbers of persons to voluntarily seek inoculation against Typhoid. It is estimated that in 1914 over 100,000 persons throughout the country were immunised, and it is thought that for 1915, the number will exceed 300,000. Dr. Robertson—the Health Commissioner for Chicago, in a recent health bulletin claims that if immunisation attains the general recognition that small-pox prevention has secured, Typhoid will be a rare disease by 1930. He strongly urges that the general public must be taught the value of the remedy, and the need of it."

British Guiana.

Georgetown, British Guiana, has not yet got rid of typhoid, to the danger of which to the rest of the Colony Surgeon-General Wise, some time back, called attention. The figures given in his Report for 1915 are as follows* :—

"This year there has been an increased number of notifications, and the following table shows the number each year in the whole colony since February 24th, 1912, when notification became compulsory."

(1) Year.	(2) Number of Notifications. (*a*) Whole Colony.	(*b*) City of Georgetown.
1912 March to December ..	308	160
1913	420	254
1914	265	154
1915	419	192

Anti-Typhoid Inoculation, New South Wales.

The Department of Public Health, New South Wales, has done much to popularize anti-typhoid inoculation by a free issue of the necessary vaccine. Forbes was understood to be the chief centre of typhoid infection in New South Wales. It was decided by the local medical men

"to open up with the help of the local Municipal Council a free anti-typhoid inoculation depôt at the Town Hall. Four afternoons a week

* British Guiana. Report of the Surgeon-General for the Nine Months, April to December, 1915. 1916. Georgetown, Demerara: The Argosy Co., Ltd., p. 15.

were set apart for this purpose during a period of two months, beginning on 28th September, 1914, each of the four medical men of the town taking duty one afternoon a week. . . .

"During this period a total of 2,059 people were inoculated, 1,928 receiving three doses, 70 two doses, and 60 one dose of the departmental anti-typhoid vaccine. The greatest number inoculated during one afternoon was 450. . . .

"At the present, twelve months afterwards, we were able to see the result of the campaign. . . . This shows a considerable decrease during the past season as compared with previous years, being thirty-seven below the average of the previous thirteen years, and forty-six below the average of the previous two years."

Nigeria.

The Annual Medical and Sanitary Report for Nigeria, 1915, urges the following precautionary measures:—

"It would be wise were all young men, coming out to the Northern Provinces for the first time, obliged to submit to anti-typhoid inoculation before leaving home, just as in the case of vaccination. They are the most susceptible, and, with very few exceptions, are likely to be posted to stations in the bush remote from hospitals on their first arrival.

"In the dusty, wind-swept north, a very obvious means of prevention, in addition to the routine methods, is to furnish each European with a compound sufficiently large in area to be self-contained, so far as sanitation goes, in order that the transport of latrine buckets through the station may be avoided. This is now under consideration." [p. 16.]

Tuberculosis.

The Resident Medical Officer of the Lagos Hospital states*:—

"Tuberculosis is increasing and is of a most virulent type, and at Calabar there have been six deaths from this disease. Personally, I am also of opinion that the disease is extending, and other Medical Officers hold the same view.

"In Lagos special accommodation is already provided for the treatment of prisoners suffering from the affection, and a special ward could, I think, be arranged without much expense for general patients in connection with the Hospital on the Ikoyi Plains. In any case, however, the question of setting aside special wards in the large centres for cases of this disease is one which will soon become prominent."

Ankylostomiasis.

The influence of moisture on soil, as a factor in perpetuating this disease, is thus alluded to in the Annual Report of the Fiji Medical Department for 1915:—

"*Ankylostomiasis.*—Continues to be a disease of the wet districts, and of them the Navua medical district suffers more than any other. A considerable proportion of newly arrived Indians bring the disease with them. With these it dies down, or is in abeyance, when they are fortunate enough to be sent to a dry district, but it is bound to light up if they go to such districts as Navua or Rewa, though not to such an extent in the latter. The disease accounts for the heavy sickness rate and mortality rate in the

* Nigeria Annual Medical and Sanitary Reports of the Northern and Southern Provinces for the year ending 31st December, 1915, p. 50.

Navua district, and has now spread to some extent amongst the native Fijians who live in the neighbourhood of the sugar plantations of this district. Measures of considerable energy continue to be taken by the medical officers in charge, with good results. The medical officer at Navua, in his health report to the Central Board of Health, reports that, of a total of 1,380 cases inspected, 718 were found to be infected—a percentage of 52·02—and that during 1915, 3,109 cases were treated at the local hospital. He reports, also, that the results of treatment have been most gratifying, and that the working capacity of the labourers has been enormously increased as a result of constant systematic inspection and treatment and improved sanitary conditions. He forms the conclusion that 40 per cent. of the Indian population of the district, including indentured and time-expired, are tainted with this infection. From this district it is also reported that, during a short period, 27 Fijians have been treated by the medical officer, besides others treated by the native medical practitioner in the hills, in the inland part of the district. The medical officer reports that his efforts, and those of his predecessors, have been well supported by the management of the local sugar plantation and the hospital attendant. It has been pointed out in a former paragraph of this report that Navua is the most unhealthy district in the Colony, and figures were given to support this statement—it may be here stated that the unhealthiness of the district is, without doubt, due in the main to the prevalence of ankylostomiasis and that the prevalence of the disease is materially assisted by the abnormally wet climate, swampy nature of the ground, and difficulties in the way of efficient drainage." [p. 6.]

Small-pox.

Preserved Vaccine.

In Vol. 5, No. 3 of this *Bulletin* [Sanitation Number, February 28th, 1915, p. 164] the possibility of storing animal vaccine in a refrigerator unmixed with any medium with the result of increasing the activity, as suggested by Major Patton, I.M.S., was alluded to. The method was experimentally adopted in the Madras Presidency. Major W. A. Justice, I.M.S., Sanitary Commissioner for Madras, in forwarding the "Annual Report on Vaccination in the Madras Presidency and on the work of the Vaccine Section King Institute of Preventive Medicine, Guindy, for 1915–16," states :—

"As explained by the Director in paragraph 7 of his report [the general low percentage of success] should be attributed to the new method of storing vaccine pulp in the raw condition, and grinding and mixing it with lanoline as required for issue. This having proved a failure was abandoned so soon as the unsatisfactory results became apparent." [p. 1.]

Dr. Maitland Gibson, Director King Institute, makes the following remarks on the allied subject of getting rid of extraneous organisms :—

"The reduction of extraneous germs in animal vaccine without injury to the vaccine itself continues to be an unattainable ideal in India. Experiments were made to effect this by means of added preservatives and storing the vaccine in vacuo. As the organisms in vaccine are aerobic it was hoped to at least prevent multiplication in this way. Certain of the germs showed, however, that they were only facultative aerobes and could multiply quite readily in vacuo. At body temperature in vacuo vaccine showed no improved keeping quality." [p. 11.]

Surgeon-General Wise in his Medical Report for British Guiana, 1915, reports as to vaccine as follows :—

"Special lanolinated lymph from the Lister Institute, England, is now used instead of glycerinated lymph and is found more successful." [p. 21.]

The Use of Buffaloes as Vaccinifers.

Buffaloes were used in the Vaccine and Pasteur Institute at Weltevreden, in 1913, with the following results* :—

"*Quantity of vaccine produced.* During 1913, 154 buffaloes were used for the production of vaccine, in comparison with 159 in 1912, which supplied a total amount of 27,475 kg. vaccine pulp, in comparison with 19,259 kg. in 1912. On an average 178·5 grammes of pulp per buffalo was obtained, in comparison with 121·1 grammes per buffalo during the previous year. The average production per buffalo in 1913 was therefore about 57 grammes more.

"The inoculation was unsuccessful in one case ; in two cases the crops were lost as the buffaloes died before the vaccine was obtained. The quantities obtained from the remaining 151 buffaloes varied from 115 grammes the least to 273 grammes the most produced per animal. In nearly all cases the lymph was taken from the animals on the fourth day ; in two instances on the third and thirteen times on the fifth day."

Beriberi.

In the Annual Report on Hospitals and Dispensaries in Burma for 1914 the Medical Superintendent, General Hospital, Rangoon, reports as follows :—

"It may not be out of place to point out how curiously limited the seasonal prevalence of beriberi is in Rangoon. Every year acute cases begin to occur in September and become rare in November, although the subacute and chronic cases are commonest then, and in January the disease stops."

At the Civil Hospital, Akyab, there were 65 cases of beriberi treated against 38 in 1913. The disease is said to be steadily increasing and is becoming a serious factor in the morbidity and mortality of Akyab town. In these cases, the majority consumed hand-milled rice and the evidence as to seasonal prevalence of the disorder is also marked, the autumn and cold weather returning the greatest number of cases.

Measles and Diphtheria.

Dr. J. Long, Director of Public Health, Philippines, makes the following remarks in his Report for 1915† :—

"Although in too few cases to permit of the drawing of a conclusion with reference to the exact extent of the association, so often encountered elsewhere, between measles and diphtheria, the rough fact at least of this association has been established by systematic swabbing of all cases of measles as presumptive carriers of diphtheria.

"The special swabbing was made in 55 cases of measles during November and December with the result that five diphtheria carriers were discovered among them, which figure, for the time covered by this report, gives a percentage of 9·09. . . . "

---

* Mededeelingen van den Burgerlijken Geneeskundigen Dienst in Nederlandsch-Indië 1915, Vol. 4, p. 43.

† Report of the Philippine Health Service for the Fiscal Year from Jan. 1st to Dec. 31st, 1915. 1916. Manila : Bureau of Printing, pp. 33, 34, 35, 36.

"The relationship discovered between two of the most typical cases and a probable infection of the schools, where the prevalence of the disease is a feature ordinarily met with in all countries where diphtheria exists, led to a comprehensive survey of diphtheria carriers directed to the detection of same among exposed people in private households and principally in the schools and other institutions. A tabulated report of the facts which followed this survey is given as follows :—

Diphtheria survey, October, 1915.

	Number.	Per cent.
Carriers found in schools	475	13·82
Carriers found in private households	145	9·92
Total	620	12·29

November, 1915.

	Number.	Per cent.
Carriers found in schools	30	2·18
Carriers found in private households	8	1·97
Total	38	2·13

December, 1915.

	Number.	Per cent.
Carriers found in schools	1	50·00
Carriers found in private households	10	9·00
Total	11	9·82

"From the data tabulated above and after an attentive study of the situation the following facts were disclosed :—

"1. A percentage of 9·64 of diphtheria carriers found among exposed but otherwise healthy people both in schools and private households, can only be regarded as excessive in comparison with an average of 3 per 100 reported in the current incidence of the disease in New York and other cities of the United States.

"2. The special significance of this excessive number of carriers as regards :—

"(*a*) The perpetuation of a certain strain of diphtheria bacilli in Manila by means of uncontrolled carriers;

"(*b*) The special importance of this number of carriers as an eloquent indication of an actual or closely threatening epidemic.

"3. The high proportion of virulent cultures taken from carriers, amounting, according to a report rendered by the Bureau of Science, to 35·71 per 100. The test of virulence was performed on, and caused the death of, guinea-pigs in three days.

"4. The fact as shown by a report of the medical officer in charge of San Lazaro Hospital, that out of 602 carriers hospitalized not less than 22 (3·65 per 100) developed symptoms of diphtheria of varying severity. This observation tends to indicate the possibility that actually harmless diphtheria bacilli in healthy carriers may assume a higher degree of virulence, and then cause the development of clinical symptoms.

"5. That this serious condition of affairs made it imperative to employ energetic measures as represented by the extensive taking of swabs from suspicious or exposed people, and strict hospitalization of all cases and carriers; this for the reason that the house isolation of the people as affected would afford very little, if any, safety in such a country as the Philippines, where in the average case neither the construction of the houses nor the close and affectionate intimacy among the members of a family would warrant dependence upon any form of house isolation or quarantine. The total number of people hospitalized (cases and carriers) on account of diphtheria during 1915 was 807."

Food.

The Government Chemist (W. Ralston, B.Sc., Lond., F.I.C.), Nigeria, gives the composition of food stuffs as tabulated* :—

Composition of Food Stuffs; Percentages.

Foodstuffs.	Refuse and dirt.	Dry Solids.	Water.	Ash.	Fibre.	Proteids.	Carbohydrates.	Oil.	Calories per lb.
Rice	·67	84·12	15·88	·45	·10	7·31	75·83	.43	1532
Yam (ordinary)	16·5	33·38	66·62	·64	·41	2·02	30·24	·07	597
Cocoa-Yam	113·0	39·49	60·51	1·05	·57	2·44	35·30	·12	702
Sweet Potatoes	15·4	43·9	56·1	·54	1·0	1·94	39·99	·43	799
Foofoo (wet)	—	33·12	66·88	·28	1·23	·69	30·80	·12	600
(dry)	—	92·93	7·07	·77	3·44	1·93	86·44	·35	1685
,, Palm Oil	·02	—	·58	—	—	—	—	99·42	4017
Split Peas	—	87·57	12·43	2·35	1·26	24·62	57·47	1·87	1592
Oyo (fresh, green) ..	88·2	15·88	84·12	1·77	1·18	3·63	8·44	·86	276
,, (dried)	—	93·53	6·47	10·4	6·95	21·38	49·73	5·07	1625
Ockro (dried)	—	75·44	24·56	5·68	7·11	11·41	49·74	1·5	1303
Native Peppers :—									
(*a*) Small pod red and green mixed (fresh)	—	24·57	75·43	1·29	6·88	3·77	9·11	3·52	510
Small pod red and green mixed (dried) ..	—	93·25	6·75	4·89	26·10	14·32	34·57	13·37	1905
(*b*) Large pod red (dried) ..	—	93·9	6·1	5·75	25·93	17·61	31·06	13·55	1905
(*c*) Large pod green (dried) ..	—	91·85	8·15	5·35	26·30	20·69	30·41	9·1	1776
Large pod green (fresh)	—	13·48	86·52	·78	3·86	3·04	4·47	1·33	261

* Nigeria. Annual Medical and Sanitary Reports of the Northern and Southern Provinces for the Year ending 31st December, 1915, pp. 121–122.

"The yams and potatoes were cooked, mashed and dried till the weights before and after cooking were identical, and the percentages therefore may refer both to the raw material as to the cooked foodstuff. The refuse shown represents matter not eaten, while the two columns for 'Dry Solids' and 'Water' represent 100 parts of edible foodstuff, the percentages of the dry constituents being detailed in the other columns. The sum of these constituents in each case equals the total dry solids. The cocoa-yam specimen was much decayed, but normally the refuse will probably be about the same as for other yams and potatoes (15–16 per cent.).

"The 'calories per lb.' column gives a scale for comparing the food-values of the different foodstuffs, carbohydrates (with fibre) and proteids being each equivalent to 1,820 calories per lb., and the oil to 4,040 calories per lb. A former analysis of ordinary potatoes gave these a value of 438 calories per lb., so that with this result and those found for rice and split peas agreeing with published tables, the results shown in the table may be compared directly with those for other well-known foodstuffs. . . .

"Referring to my earlier work on food values as stated above, a comparison between the carbohydrates reveals the fact that yams contain about 1½ times as much starch as potatoes do. The potato has been a profitable source for alcohol, so it is to be presumed that the yam under similar conditions should be even more profitable."

Scientific Milk Adulteration.

The Sanitary Commissioner for Assam, in his Report for 1915 (p. 21), shows how the indigenous milkman, to the benefit of his purse, makes the cheaper buffaloes' milk approach the appearance and chemical composition of the dearer cow's milk :—

"The best samples were obtained from Dibrugarh, where sophistication seems less common than elsewhere. The degree of adulteration is not generally very serious. Most of the milk sold in the towns of Assam seems to consist of buffalo milk or mixed buffalo milk and cow's milk, with that proportion of water added to it which brings the amount of fat present in the milk to a proportion equal to that present in normal cow's milk, and reduces the figure for the total solids and specific gravity to below the standard of an unadulterated cow's milk in this respect. The milk as it is sold after adulteration thus contains about as much cream as ordinary cow's milk, but less of the other food constituents, but as milk fat is always considered to be the most valuable constituent of milk, the adulteration does not appear to be a very serious one."

Tea Adulteration.

The Annual Report of the Board of Scientific Advice for India states that on examining samples of teas one sample was found to contain "40 p.c. of earth" in addition to the presence of "yellow aniline dye."

Water.

The Sterilization of Water Supplies.

Under the head of "Dysentery and Diarrhoea" the Sanitary Commissioner with the Government of Bombay (Major F. H. G. Hutchinson, I.M.S.) makes the following remarks at page 8 of his Fifty-Second Annual Report for 1915 :—

"The dysentery death-rate in all these towns represents a very serious loss to the community and deserves attention. The disease, though rife

during the hot weather in many places, is mainly a monsoon epidemic: that is from 60 to 80 per cent. of the deaths are reported during the last half of the year. The line of action from which benefit is most likely to result is sterilization of the drinking water-supply. This was tried after the beginning of July in the case of Poona City and the death-rate in the year fell from 9·49 to 5·38. The important point is that only 40 per cent. of the deaths were registered in the last half of the year instead of the usual 70 or 80 per cent.: again the reduction in the death-rate between the ages of 1 and 5 was very marked during the same period: this brings forward another fact that the chief causes of death at this age period are diseases of which diarrhoea is a prominent symptom. A study of the dysentery death-rates by age periods for the districts of Poona, Sholápur, Ahmednagar, Sátára and Ratnágari emphasises the two facts that dysentery and diarrhoea are diseases especially fatal to children under the age of 5 during the monsoon months. . . .

"The monsoon epidemic is undoubtedly largely due to the washing of surface impurities into the water supplies, and a great reduction in the sickness and mortality in Poona City was obtained by sterilization of the water with chlorine. In time this benefit can be extended to other towns provided with a general water-supply. Smaller towns especially those to which pilgrims are attracted need not be neglected, for Professor Cree Brown of the Engineering College has invented an apparatus for adding chemicals in correct proportion to small quantities of water: this apparatus can be worked wherever a reliable pump can be installed."

Again, in describing the subject of "Fevers," he traces further beneficial influence of the process:—

"In all the districts with the exception of Kánara and Ratnágiri from 40 to 60 per cent. of the deaths registered from fever between June and October are among children under 5. It is well known that intestinal disorders during early years of life commonly cause fever, and are very fatal. It has been pointed out in the section on cholera that in one village 10 deaths from choleraic diarrhoea were included under the heading fever, and this is no isolated instance. It is also certain that in infective intestinal affections of children death may occur before diarrhoea has had time to set in and when fever is probably the only symptom. The experience of past years has proved that the fever death-rate is exceptionally high in those years in which cholera is epidemic. All these facts point to intestinal disorders causing some portion of the fever mortality. The causes of intestinal disorders in children are the drinking of contaminated water and the eating of impure and unsuitable food, and there can be no reasonable doubt but that measures designed with the object of eliminating impure water and food will result in a lowering of the fever death-rate in addition to improvement in the mortality from cholera and diarrhoeal diseases. Impure water and food are at the bottom of the high mortality in this Presidency, and must receive attention before any material and continued improvement in morbidity and mortality can be expected." [p. 10.]

Step Wells and Guineaworm.

Major Hutchinson, I.M.S., in his Report for 1915, as Sanitary Commissioner with the Government of Bombay, makes the following observations as to the necessity for protecting step wells from approach by persons suffering from guinea worm*:—

"As a portion of the money [£46,662] is spent on the repair and construction of wells it may be possible in the future to devote a moiety of similar grants to the eradication of guineaworm by the conversion of step-wells into draw-wells. The distribution of guineaworm has received a great deal of attention during the past 7 or 8 years, and many suggestions for

* Fifty-second Annual Report of the Sanitary Commissioner for the Government of Bombay, 1915. 1916. Bombay: Printed at the Government Central Press, p. 23.

dealing with step-wells have been sent in. A remarkable instance of the benefit given by such a simple measure is furnished by the village of Palus in Sátára District, with a population of about 4,000. In the old days a very large percentage suffered from guineaworm, it is said about 50 or 60 per cent. The favourite source of water was a step-well. Through the foresight of a revenue official the step-well was converted into a draw-well about 20 years ago. Guineaworm has almost disappeared; there are now only seven cases against as many hundreds in old days. The seven cases existing now live in two houses (five in one and two in the other), and draw water from a small step-well.

"Palus is situated in an area in which guineaworm is very prevalent, and Dr. da Gama, the Acting Deputy Sanitary Commissioner, has made a close enquiry into the conditions existing in 11 towns and villages. The population of these villages is 42,814—21,900 being males and 20,914 females. At the time of the investigation there were 1,606 persons suffering or nearly 4 per cent. The incidence on males was nearly double that on females, and the largest number of sufferers was found among adults between 15 and 40.

"The conversion of step-wells into draw-wells will not eradicate all ailments due to impure water, but, if properly done, will do away with guineaworm, and show the inhabitants of the affected areas the value of simple sanitary improvements."

Water Supply, British Guiana.

The sinking of deep artesian wells has been completed in fifteen places in British Guiana. Evidently, the necessity for well protecting sources was urgent. Surgeon-General Wise states:—

* "The customary water supply is of the most primitive character, is of bad quality and at times lacking in quantity. Ponds and trenches fed by rain or surface peaty water led through canals for many miles and freely open to surface pollution in most cases serve as the only supply. Not a single village has a supply that would conform to modern requirements. Dr. Gewand in the Skeldon District reports 'the quality of water consumed by the villagers at times is simply atrocious.' Medical Officers universally condemn these inadequate supplies and petitions for the provision of deep artesian wells are frequent. It is little wonder that intestinal diseases have in the past caused numerous deaths, incalculable sickness and irreparable loss."

---

* British Guiana. Report of the Surgeon-General for the Nine Months, April to December, 1915. 1916. Georgetown, Demerara: The Argosy Co., Ltd., pp. 12–13.

SANITARY ORGANIZATION.

Sanitary Control of Public Gatherings.

The Report of the Philippine Public Health Service for 1915 points to the important rôle in disease spread played by large gatherings of human beings for religious or other festivals. He states :—

"The 'fiesta,' which is a time-honoured institution in the Philippines and the principal event in the yearly history of each town, and which combines religious celebration of the patron saint's day or a pilgrimage to some venerated shrine with many features analogous to those of a country fair, has often been the occasion of an outbreak of dangerous communicable disease. The crowds which gather at these events are likely to contain persons recently exposed to infection or contagion, and some of the large quantity of foodstuffs which are brought in, are sure to have been contaminated. There is a tendency to excess in eating, and an indigestion thus brought on may afford just the opportunity for the development of a case of cholera in a person harbouring the organisms of this disease in a quiescent state. Twice during the past few months, at Jagna, Bohol, and at Carcar, Cebu, cases of cholera have occurred in territory in which there was no previous evidence of infection, immediately following the 'fiestas' and in persons who had attended them, and from Jagna the infection spread to four other towns and cost 31 lives." [pp. 57–58.]

In the Madras Presidency, efforts (more or less complete in accordance with funds at disposal of public bodies and other variable factors) have been systematically made since 1868 to control disease spread from foci created by pilgrim gatherings. Recently, the Government of India directed "that a comprehensive enquiry should be made over the whole of India by the Sanitary Commissioner, assisted by local officers in each Province, into the possibility of improving the Sanitary arrangements at centres where pilgrims concentrate for worship, with the special aim of reducing mortality from disease such as cholera."* A Committee† was accordingly appointed for conducting this enquiry in the Madras Presidency.

The following extracts from this Report furnish a warning of the necessity, common to all sanitary work, that it be thorough. The Committee states :—

"The second point which the Committee wish to emphasize is that, from what we could gather in the short space of time at our disposal, the smaller festivals in out-of-the-way parts of the Presidency are to be regarded with much more suspicion as foci for the spread of the disease than the large ones. This is after all what one would expect. In many of the large festivals very careful and elaborate arrangements are made, as for instance at the Chitrai festival in Madura, still more on such occasions as the Mahamakham and the Pushkarams of the Godavari and Krishna. Everything that can possibly be done by vigilant and active officials is then done

* Madras. Report of the Pilgrim Committee, 1915. 1916. Simla: Printed at the Government Monotype Press, p. 1.

† President: Lieut.-Col. W. W. Clemesha, I.M.S., Officiating Sanitary Commissioner with the Government of India. Members: Lt.-Col. H. Thomson, I.M.S., Acting Sanitary Commissioner for Madras; Mr. E. S. Lloyd, I.C.S.; The Hon. Rao Bahadur M. Ramchandra Rao Pantalu Garu, Chairman, Municipality, Ellore; Dr. H. W. McCaully Hayes, M.R.C.P., Chief Medical Officer, South Indian Railway; Dr. A. I. Jackson, F.R.C.S., District Medical Officer, Madras and Southern Mahratta Railway.

to render the spread of infection impossible, and given average luck in the way of suitable climatic conditions it is unusual for these big festivals to be a serious source of danger. We were struck with the great frequency of the remark that 'it is no use your investigating the conditions here, but you ought to pay more attention to a small dirty place situated a few miles off.' At every large pilgrim centre we have visited, particularly Rameswaram, Srirangam, Kumbakonam, Tirupati, and Conjeevaram, the same statement was made accompanied with the remark that much of the infection of the larger towns is actually derived from those places. The Committee endeavoured, as far as possible, to sift the truth of the statement, and, as far as we can judge, from the very inadequate figures placed at our disposal, we come to the conclusion that there is probably much truth in such remarks.

"It would not be fair to the local authorities to say that these smaller places are altogether neglected, but it is certainly legitimate to state that conditions in them are certainly more favourable for the spread of cholera than in large places where better arrangements and a filtered water-supply exists.

"The Committee therefore consider that the future policy of the Government should be to greatly improve both the local conditions of these smaller places and to exercise greater vigilance over them than it is at present done during festivals.

"Of course all places where the number of pilgrims is large must receive the greatest care and well-thought-out arrangements must be made early, but much of the good that will accrue from the careful supervision of these large festivals will be undone by neglecting a small and insanitary place in the immediate neighbourhood." [p. 13.]

Does Sanitation Pay?

In the Philippine Islands, the Bureau of Health is now succeeded by the Philippine Health Service. That under its former name this public service has done excellent sanitary work, is evident from the statistics now issued in the Report for 1915. The record shows that whilst, in 1911, the death-rate in Manila was 35·09 per mille it declined as follows:—

1912	33·32
1913	24·48
1914	22·38
1915	25·54

In remarking upon this manifest saving of life, Dr. J. D. Long, Director of Public Health, states *:—

"A brief review of the general conditions of the country with regard to mortality and prevalent epidemics and infections during the year covered by this report shows that every gain made during the previous years, was due not only to the continuance of the work of sanitation, but also to the fact that progress has been made in combating those diseases and reducing their morbidity and mortality to a minimum."

Notwithstanding convincing figures of this nature, municipal bodies exist in the Philippines who have a remarkable family likeness to public bodies generally, oriental and, may it be said, occidental. This is Dr. Long's testimony to the fact:—

"In the remaining provinces there seems to be no possibility of effecting the organization during 1916. A number of them, according to statements of the provincial treasurers, are facing deficits, or have already incurred

* Report of the Philippine Health Service for the Fiscal Year from January 1st to December 31st, 1915. 1916. Manila: Bureau of Printing, p. 6.

heavy fixed term obligations or are carrying overdrafts, and in several it would appear that a term of years will be required to arrive at a satisfactory financial basis. There is a disposition on the part of some to let health matters go in ordinary times, and to depend upon this service when the inevitable result appears in the form of an epidemic, and on that of others to treat the health budget with much less liberality than those of other branches of governmental activity, and to scan it first when the need for retrenchment arises. It has frequently been necessary to object to the abolition of a sanitary inspector's position for which the reason of a reduction of expenses was advanced, in municipalities in which no other attempt at economy was evident, and one province which had a good health organization threw it bodily overboard about two years ago in endeavouring to avoid financial shipwreck. The protection of the public health is as essential a part of the functions of government as is the preservation of public order or the prevention and punishment of crime, but this conception has not yet thoroughly permeated the public conscience, of which governmental activities are but the reflection. Meanwhile, the legal obligation of the provincial and municipal governments to make provision for a health fund at the earliest possible moment must be insisted upon. The budgets of those provinces and municipalities which have not done so, should be carefully scrutinized for possibilities of economy, and no province or municipality should be allowed to undertake any new project which would interfere with its duty in this regard or in any other way to increase its expenses, until it has first fulfilled this obligation, and it is strongly recommended that His Excellency, the Governor-General be urged to issue instructions in this sense." [pp. 46–47.]

Part-Time Sanitary Officials.

The Central Board of Health, Jamaica, opens its Report for the year ending 31st March, 1916, with the following definite opinion as to part-time Sanitary officials :—

*" The Central Board of Health have in the period under review, and as the result of experience of the sanitary work of the Parishes, maintained the position that in parishes, particularly those of large area, it is not in the public interests for the sanitary work to be performed by one Health Officer of Health, who is a part-time officer."

What may be accomplished by a correctly supervised Sanitary staff is thus exemplified, in the same Report, by Dr. Oliver Crosswell :—

" In this connection I might remark that I have given, with the able assistance of Mr. E. Glen Campbell, the chief Sanitary Inspector and staff of Sanitary Officers, much attention to food supplies and more sanitary methods of handling food stuffs; and the suppression of flies and their breeding places. A special ' Trades ' Sanitary Inspector, Mr. C. P. Hogarth, has been placed in charge of this special work in the scheme of re-organization now under trial. He is performing excellent work and has already revolutionised the hitherto insanitary habits of the small shop-keeper and vendor of food stuffs in the wanton exposure of their easily infected stock to contamination by dust and flies. In the shops all such food stuffs are now required to be kept under cover. In the barber shops, proper sterilization of equipment is demanded, and it is now possible to obtain a sanitary hair-cut and shave in a majority of the more respectable shops. In the cafés and restaurants, with a few exceptions, doors and other openings are screened with mesh wire against flies.

" The local ice-supply from the Central Factory to the small distributing branch shops has become more sanitary, and each vendor is now compelled to store his supply of ice in a proper sanitary box. . . .

---

* Jamaica. Annual Report of the Central Board of Health for the Year ended 31st March, 1916. Jamaica: Government Printing Office, Kingston, p. 1.

"So long as Bakers are allowed to bake their bread in unsewered premises with liquid manure running from their tables into open yard gutters . . . and employees are allowed to deliver unwrapped loave with dirty hands and without due regard to cleanliness of apparel; and in the case of the milk purveyor, so long as milk can be hawked about on the streets without proper restrictions being placed on this kind of itinerant trading, so long will Typhoid Fever and intestinal complaints be rampant in this parish." [pp. 10 and 11.]

Public Health Service, Madras Presidency Personnel.

The Sanitary Commissioner with the Government of Madras, in his Fifty-second Annual Report for 1915, states that 31 Municipalities have been selected for the appointment of Health Officers, but that difficulty was experienced in filling the whole during the year. He states:—

"The qualification required for appointment as First-class Health Officers is a medical qualification registrable under the British Medical Act and a British Diploma in Public Health.* For a Second-class Health Officer, the minimum qualification required is an L. M. & S. degree and a certificate of having undergone the special practical training prescribed in G.O.1568M., dated 29th September, 1915. . . . During 1915, forty-three men qualified as Assistant Sanitary Inspectors and 26 Assistant Sanitary Inspectors took the higher qualification of Sanitary Inspectors, after undergoing a course of practical and theoretical training in Minor Sanitary Engineering. Thirteen Sanitary Inspectors employed under Local Bodies passed the quinquennial examination prescribed by Government and twenty-one qualified as Vaccinators at the King Institute. One of our Chief Sanitary Inspectors (Cocanada) was selected for sanitary duty under the Civil Surgeon of Basra." [p. 12.]

Accessory Aids to the Health Service.

Major Justice, I.M.S., gives the following note on this aspect of sanitary efforts †:—

"Considerable interest has been aroused in, and an additional impetus given to the question of town-planning by the visit of Professor Geddes. Since his advent, it has formed the subject of reports by Messrs. Lloyd, and Lancashire and lastly by Mr. Lanchester who have overhauled the various schemes which the municipal councils had on hand. The reports of the first named officer have already been considered in consultation with the Sanitary Commissioner, whilst those of Mr. Lancashire and Mr. Lanchester are under consideration. It is hoped that as a result it will be possible to evolve workable schemes, which whilst satisfying artistic and architectural designs will not fail to meet sanitary requirements. . . . An important feature of the year's work was the assembly of the Pilgrim Committee of this Presidency with the Sanitary Commissioner with the Government of India at its head. The Committee made an extended tour to the more important pilgrim centres and the result of its labours has been embodied in an interesting report which will doubtless receive the careful consideration of Government. The Pilgrim Committee closed its sittings at Madras on the 18th September. A photographer was attached to the Sanitary Commissioner on his tours with the Committee and several interesting photographs illustrative of sanitary defects for making lantern slides for the health lectures were taken.

---

* B.S. Sc., of the Madras University, has since been declared to be equivalent to D.P.H. of the United Kingdom.

† Madras. Fifty-Second Annual Report of the Sanitary Commissioner, 1915. 1916. Madras: Supt. Govt. Press, pp. 13 and 17.

"The Health Exhibition held during the close of the year and the lectures delivered in connection therewith were another interesting feature. The Exhibition which was organised and carried out with considerable thought and skill was a great success and doubtless afforded a useful object lesson and a stimulus to interest in matters sanitary. Such exhibitions coupled with the health lectures illustrated by lantern slides, for the delivery of which arrangements are approaching completion, should be helpful in maintaining the interest already aroused and in gradually educating the masses on the benefits of sanitation."

The Value of Laboratories in Disease Prevention.

Dr. J. Long, Director of Public Health in the Philippines, thus asserts the value of laboratories in aiding sanitary efforts in preventing and controlling disease spread* :—

"The health officer who has no laboratory facilities at his disposal is most seriously handicapped in his efforts to prevent the spread of these diseases, as the effectiveness of the appropriate special preventive measures depends to so large a degree upon the promptness with which they are applied, and this in turn upon an early diagnosis which frequently cannot be had without laboratory methods. Indeed the most effective measures which can be taken against some of the most dangerous of the dangerous communicable diseases, are the detection and isolation of those apparently healthy persons who nevertheless are carriers of the respective organisms, and here the detection is entirely a laboratory procedure.

"Until this year, there were no laboratories outside of Manila except in connection with various hospitals, and the remainder of the provinces, a large majority, were without these facilities. Their usefulness and the great need existing for them, was brought to the attention of the provincial boards with a request in each case for the appropriation of the comparatively small sum required for their establishment. . . ."

"A comparison of the history of the Cebu outbreak [cholera] with that of those in Bohol and La Union, both promptly reported, and efficiently handled, is a most complete demonstration of the necessity of providing all the provinces with laboratories. The measures taken in the latter districts, consisting of house quarantine of cases and contacts, disinfection, burying of excreta, wholesale hand washing with disinfectant solutions, and protection of water and food, had necessarily to be applied to all who were under suspicion of being dangerous to the health of the public. In Cebu, it was possible to point out through the results of laboratory examinations just those persons who were harbouring in their intestines bacteria dangerous both to themselves and the public, and to limit the measures taken to such persons, so that they were at the same time less onerous, less expensive, and more effective."

Protection of Milk Supplies.

The Report of the Director-General of Public Health, New South Wales, for 1914, shows that the subject of sanitary care of the people is enforced by several highly practical legislative measures. As far back as 1886, the Dairies Supervision Act was passed. The administration under this Act is not left to casual efforts by various public bodies, but is under the direct care of the Department of the Public Health. Under it serve a Chief Veterinary Inspector, aided by an Assistant Veterinary Surgeon with control over fourteen Inspectors in the Metropolitan District; for rural areas, fourteen Inspectors are solely

* Report of the Philippine Health Service for the Fiscal Year from January 1st to December 31st, 1915. 1916. Manila: Bureau of Printing. pp. 48 and 50–51.

occupied in travelling throughout dairying districts, making detailed inspections. They have to deal with 19,000 registered dairymen and dairy herds of 500,000. Dr. Robert Paton, the Director-General of Public Health, describes the objects held in view by his Department :—

"The desire of the Department has been always that the work of these inspectors should be educational, and that structural improvements to dairy premises and the maintenance of a high standard of cleanliness should be secured without recourse to harsh measures, except where more conciliatory treatment has failed to obtain the desired object. . . .

"For the purpose of economy and to save duplication of work, the dairy instructors of the Department of Agriculture were authorised as inspectors under the Board of Health, with the object of handing over to them the inspection of butter factories and creameries. This arrangement has now been in operation for a couple of years, and is found to work satisfactorily. . . . It is evident that if this important industry is to be maintained at a high standard, the inspectorial staff must be constantly on the alert to ensure that the standard required by the Board is closely followed. Another feature that commends itself to the Department is that local authorities who are charged with carrying out the provisions have lately been seeking advice from the expert officers of the Department in regard to various matters connected with the dairying industry—such, for instance, as the selection of a suitable site, construction, drainage, and ventilation, etc., of dairy premises. The adoption of the advice given will result in more hygienic and up-to-date methods being adopted." [p. 5.]

Meat Export Supervision.

New South Wales has not allowed its valuable trade in meat to run the risk of being jeopardized by the possibly avaricious trader. The Cattle Slaughtering Act of 1892 gives full power of supervision of the trade, and this rightly is administered by the Department of Public Health. For this purpose, there exists a separate branch of fifteen inspectors under an experienced Veterinary Surgeon.

The figures appended for 1914 will show the magnitude of the meat export trade of this State. The canning business in particular is rapidly expanding, and the value alone of the canned meats and meat extracts exported during 1914 is roughly estimated at three-quarters of a million sterling.

Meat and meat extracts, etc., exported during 1914 :—

Packages of canned meats	437,429
Packages of meat extracts and essences ..	7,129
Carcases of mutton and lamb	1,925,756
Carcases of veal	13,296½
Carcases of pork	402½
Beef quarters	160,385
Packages of meat (other than carcases) ..	54,276

SANITARY RULINGS.

Jamaica.

The Central Board of Health, Jamaica, among other efforts towards sanitary legislation, places on record the following* :—

"They recommended that Law 35 of 1910 be amended so as to give the Board power to pass Bye-laws with regard to Enteric Carriers, also to institute a procedure by which persons could appeal against questionable nuisance Orders, in view of a somewhat hard case that had been brought to their notice in one of the parishes. They also desired to have brought into force legislation with regard to the registration of and practice of miwifery by midwives in the Island and also for an amendment to the Registration Law enforcing earlier notification of Births in accordance with the most recent British Law with a view to a reduction in the very high infant death-rate." . . .

"Additional Bye-laws *re* bakehouses compelling the wearing of uniforms by persons employed in bakehouses in the towns of St. Ann's Bay and Brown's Town." . . .

"Bye-laws relating to the Medical examination of persons employed in the selling of confectionery, sweetmeats, cakes, etc." . . .

"It was suggested by the Hon. H. A. L. Simpson that the Bakehouses Bye-laws should provide that the certificate of an employee should be suspended if, while in possession of it, he was found to be suffering from disease liable to infect. Bye-laws not containing this provision have before approval been returned to various Parochial Boards concerned with the suggestion that it should be adopted and in all cases the suggestion has been adopted. The suggestion was a very necessary one." . . .

"The undermentioned were recommended by the Central Board of Health to the Government to be added as Nuisances to the Proclamation made by the Governor in Privy Council on 25. 8. 13, but the recommendation was not approved by the Government.

"1. The absence from any premises, on which there is a dwelling or on which labourers are employed or do work, of a sufficient and sanitary (flyproof where required) latrine or privy or of such number and of such description and construction and in such position as may be required by the Medical Officer of Health.

"In the case of Estates on which indentured or second term coolies are employed the absence of such sufficient and sanitary flyproof latrines or privies of such number, description and construction as the M. O. H. or Medical Officer appointed by the Governor to be in medical charge of each estate shall require to be provided.

"Provided always that such latrines or privies are not so called 'surface latrines' and are properly protected from access of beast or bird; and provided always that it is a proper water closet, bucket latrine or pit, passed as satisfactory by the M. O. H., and that in each case it is protected from wind, weather and seepage.

"2. The omission to keep a latrine or privy in a clean and sanitary condition at all times.

"3. The omission to empty buckets when full or to empty or fill in pits when full up to within two feet of the ground.

"4. The existence of rat holes or rat runs in any house or wharf or yard or other premises."

Overcrowding.

The General Board of Health, Trinidad and Tobago, during 1915 issued an order regulating space per head in dwellings. Its provisions are two :—

---

* Jamaica. Annual Report of the Central Board of Health for the Year ended 31st March, 1916. Jamaica: Government Printing Office, Kingston, pp. 2, 3, 4.

" 1st.—That on the serving on the owner and occupier of certificates by the Sanitary Inspector of unfitness of any room or part of a house for human habitation, the room, etc., shall be vacated within six days.

" 2nd.—The minimum space allowable for each person in an inhabited room shall be 300 cubic feet, and the area of the ventilating openings in addition to usual doors and windows shall amount to one-tenth of the floor space.

" The operation of this Order will no doubt result in lasting and perceptible good, more especially in the dwellings of the poorer class. For a number of years under Dr. Dickson's instructions, attempts had been made to advise house-owners to improve the ventilation of the worst types of dwellings. The result had been very disappointing, and only a show of doing something resulted in a few cases, for the reason that there was no power to enforce the structural improvements that were considered necessary."*

Straits Settlements.

The new Quarantine Ordinance of the Straits Settlements " gives discretionary power to the Port Health Officer to prevent the arrival in the Colony among others of people suffering from syphilis." The following are details given by Dr. G. A. Brooke, the Chief Health Officer, Singapore, of other rulings secured† :—

" (*a*) An attempt has been made (as far as I know, for the first time in any statute-book) to lay down a standard of epidemicity. Such a standard must of course be an arbitrary one, but is most useful as a outine indication for the imposition of quarantine restrictions. If generally adopted it would much simplify matters for the Commercial world. The standard now chosen was only adopted after weekly returns had been charted, and infected arrivals noted, from all the chief Eastern ports, for a period of over 10 years.

" (*b*) Another new feature is the recognition as ' suspected ' of any port at which infectious disease exists in a merely ' sporadic ' state.

" (*c*) The vaccination of unprotected immigrants from China and India is now insisted on.

" (*d*) Considerable discretionary powers are given for the detention and treatment of contagious ophthalmia, trachoma, phthisis, syphilis, malaria, etc., occurring amongst immigrants ; and for the repatriation of those whose entry would be undesirable owing to chronic diseased conditions.

" (*e*) A new section has been added dealing with nuisances on ships, and giving wide powers for the abatement of them.

" (*f*) A new Bill of Health has been introduced. The stereotyped and more or less universal form which was previously in use, gave a minimum of information and a maximum of verbiage. It is hoped that the form now adopted will be of some real and practical use to the Health Officers in other ports.

" (*g*) The principle is now recognised of not requiring quarantine restrictions at subsequent ports in the Colony in the case of certain ships which have been examined and given pratique at their first port of arrival. Such a permit is not given to immigrant or other classes of suspicious ships ; but, generally speaking, mail steamers and cargo-boats will come under the category, and such a privilege will be of great commercial advantage to the shipping firms."

---

* Trinidad and Tobago. Medical Report of the Surgeon-General for the Nine Months ended the 31st December, 1915. Council Paper No. 133 of 1916, pp. 27–28.

† Straits Settlements Medical Report for the Year 1915. p. 69.

Rat-Proofing Buildings.

At Tacoma, Washington, America, the following concise ruling has been issued* :—

"The foundation walls of all buildings hereafter erected in the city of Tacoma, built less than 18 inches above the level of the ground at all points, shall be of concrete or of brick or stone laid in cement or mortar, or of some other equally good rat-proofing material. The walls, if constructed of concrete, shall be not less than six inches thick, and if constructed of brick or stone, not less than eight inches thick. Such walls shall extend around the entire area to be occupied by the building and below the surface of the ground to a depth of at least 18 inches. Any building in which foodstuffs of any kind, whether for man or animals, are to be stored or offered for sale, shall have the full floor area covered by concrete not less than three inches thick, and all floors which are situated below the level of the lowest street on which the building impinges shall be similarly covered by a layer of concrete not less than three inches thick."

* U.S. Public Health Reports. 1916. Dec. 8. Vol. 31. No. 49. p. 3397.

TREATMENT OF WASTE.

Night Soil Disposal in New South Wales.

The following is a description of a method of treating night soil as practised by Messrs. Stamp and Powell, of Canterbury, New South Wales* :—

"The first operation of filling the cylinders with night-soil was performed. . . . It is in these cylinders—which are known as the Stamp-Powell Patent Vacuum Revolving Driers—that the main portion of the process is thus carried out; the dimensions of the cylinders are 12 ft. × 6 ft.

"The necessary heat is applied by means of steam between the inside and outside cylinders and as the cylinder revolves the night-soil contents become thoroughly evaporated, all noxious smells are drawn off by means of the special vacuum plant and pass from the cylinder through a surface condenser, thence to the vacuum pumps, discharging into a dome-topped brick and cement tank, the effluent being used for market gardening, the foul air being led away by means of a pipe to the boiler fires. After eleven hours of drying treatment, the residue left in the cylinders is automatically turned out by simply taking off the man hole in the outside of the cylinder. There is nothing offensive whatever in the residue, which is then further put through a grinder and made up into an excellent fertilizer known as Poudrette."

The Private Septic Tank or "Salga."

In its Public Health Bulletin, No. 68, of 1915, the United States Service sets forth for general information certain principles as to the disposal of human excreta in unsewered homes. After describing a box arrangement (protected by a fly proof lid) containing a movable receptacle for faeces, they illustrate the method of using septic action in securing liquefaction of faecal matter.

The following illustration (fig. 1) sufficiently explains itself. It is known as the L. R. S. (Lumsden, Roberts and Style) privy :—

Fig. 1.

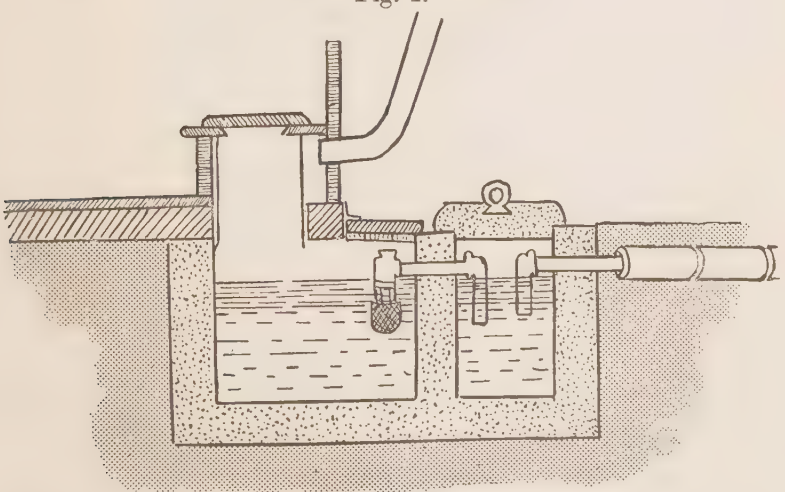


Fig. 1. † An L. R. S. privy with tanks made of concrete and with direct distribution of effluent into top soil.

* Disposal of Sanitary Matter Revolutionized. S.P.R. Process, 1915. October. B. & R. Fertilizers, Ltd., Canterbury, N.S.W. p. 8.

† Figs. 1, 2 and 3 reproduced by permission from the United States Public Health Bulletin.

A more advanced form of the L. R. S. privy is known as the "Kentucky Sanitary Privy" as shown in fig. 2. "In the privy there are three tanks, and the effluent from the final tank is discharged into a system of drain tiles arranged to distribute the effluent under the surface of the soil. In the construction of this privy, it would be well to make provision for cleansing the tanks."

Fig. 2.

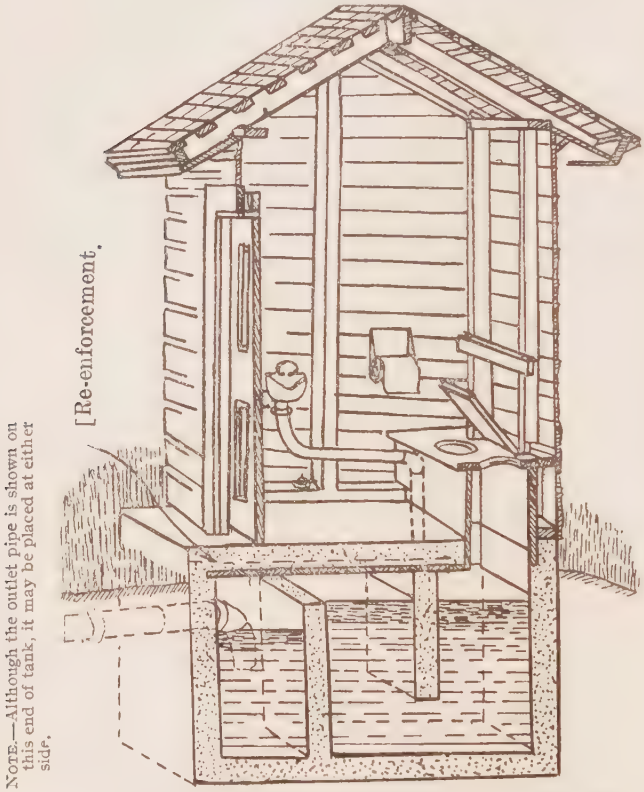


Fig. 2. The Kentucky Sanitary Privy (Kentucky State Board of Health, 1913).

A roseate view of the result of using the L. R. S. (septic tank) effluent is thus illustrated.

Fig. 3.

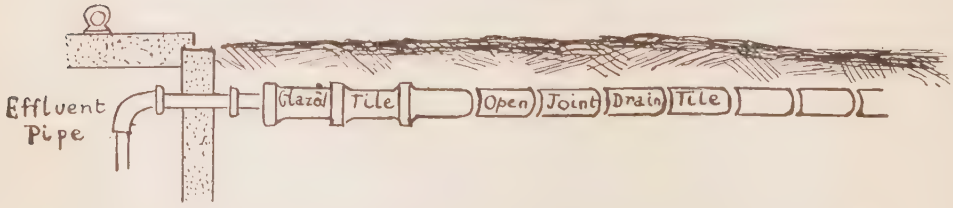


Fig. 3. Distribution of effluent from an L. R. S. privy into top soil. The effluent pipe is cemented into a glazed (water-tight) terra-cotta pipe which extends to the disposal ground. The effluent is distributed into the soil by means of open-joint drain tile.

[Note.—The original drawing shows rose bushes growing above the drain.]

SANITARY WORKS.

Anti-Malaria Works.

"*Anti-malaria Drainage.*—A scheme for anti-malaria drainage work in the Purasawakkam area Madras has also been designed. The general principle is to drain the tanks to the lowest level possible by gravitation. The drains are designed to discharge into the Otteri Nullah at various points. As an experiment, a small portion of the scheme has already been carried out, and the results are sufficiently favourable to indicate that the execution of the whole of the proposed scheme is most desirable in order to drain the Purasawakkam tanks and swamps which form such extensive breeding grounds for malaria-carrying mosquitoes. . . . In the year under review the total mortality was 36·0 per mille as against 46·6 per mille in 1914 and the causes conducive to such happier times have been indicated in the report of the Health Officer. Amongst these causes decreased malaria has contributed to rendering the city healthier and to keeping down the total mortality rate. . . . Anti-malarial measures in the Mylapore Division of the city are conducted with much less opposition and greater co-operation and necessarily better work of a permanent nature was done during the year under review. This has resulted in a perceptible improvement from the point of view of malaria. The total mortality was 35·8 per mille as against 48·8 per mille in 1914 and the mortality from fever 2·4 as against 5·3 or 6·75 per cent. of the total mortality as against 10·90 per cent. in 1914. That is, while the fall in total mortality for 1915 was only 26·65 per cent. that from fevers was 54·70 per cent. Nor is the infantile mortality behind. It was 253·8 against 295·0 in 1914."*

Cost of Design and Execution of Works.

The Administration Report of the Madras Corporation 1915–16 gives the following useful figures on the above subjects [p. 123]:— Waterworks, value of work designed R.68,09,500; percentage of designing establishment on value of work designed, 2·86; value of work executed, R.42,76,955; percentage of supervision on value of work executed, 3·51.

Silting.

The prevention of soil erosion is of importance in connection with anti-malaria work and agriculture. The process, as conducted at Java, is thus described by *Indian Engineering* (Calcutta), of October 14th, 1916, pp. 245–6.

"When the land slopes steeply it is terraced and provided with contour drains edged with hedges of leguminous plants; where the slope is moderate there is a system of catch-water trenches in contour alignment. In terracing it is obvious that some of the plants will lie on subsoil unless it is arranged to use the contour drain soil to cover the subsoil, and this may constitute one objection to terracing; but it is not a serious one. In lieu of terracing it is sometimes the practice to pile weeds between the rows of tea planted in contour lines and thus gradually to build up a system of small terraces, after the tea has been planted out, which prove quite effective. In Java they always protect the edge and face of a terrace with some description of tenacious plant, and when the terrace is fairly broad they dig short trenches at intervals along its inner edge to catch any soil that comes down from above, and when these trenches are cleared periodically the soil collected is always flung up on to the upper terrace.

* Administration Report of the Corporation of Madras for 1915–1916. 1916. Madras: Thompson & Co. p. 29.

Where the slope is moderate and the land not terraced, the usual practice is to have a contour trench. Then one or two rows of tea plants, then a contour line of green crops, then again one or two rows of tea plants, then another contour trench, and so down the slope. The positions of the catch trenches, which are usually about 12 feet long by 1 foot broad by 1½ feet deep, alternate with 12 feet intervals along the contours, and are arranged in echelon with those next above, so that if any soil is carried past one line of trenches and past the intermediate tea bushes and green crop hedge, it will be eventually caught in the next trench below. Here, too, when the trenches are cleared the soil is invariably flung up the slope. It must be remembered that the basis of any system is perfect drainage, be the ground steeply sloping or otherwise ; main drains leading down the slope catch all the water collected by the contour drains and subsidiary ones discharging into them, the important thing being to carry away rapidly all excess water which cannot sink into the ground sufficiently rapidly in case of heavy showers. The main drains leading down are usually natural ravines which require but little adjustment ; when they are wholly artificial, naturally the sites selected are between concave folds of the ground along which the drain is cut, the sides are grassed and the rush of water in them is interrupted by a series of low barriers of stones, bamboos, etc."

Difficulties in Sewerage Works.

The Administration Report of the Madras Corporation for 1915–1916 gives the following account of the difficulties in laying sewers in a treacherous subsoil saturated with water :—

" The principal works in course of execution are the Gravitation Mains for the Napier Park and Purasawakkam areas. In constructing these mains, great difficulties have been encountered due to water and bad ground. This has been more particularly the case with the Purasawakkam Main, where it was found necessary to use interlocking steel piles for excavation, and to substitute cast-iron pipes for the brick sewer originally intended. The ground in which the pipes were laid proved so treacherous that very special methods had to be adopted. For a considerable length the ground consisted of semi-liquid black mud, necessitating the driving of long timber bearer piles with cross pieces, to which the pipes were strapped to prevent their sinking into the mud when they were full, or being forced upwards by the mud when empty. These difficulties coupled with the rise in prices have caused the cost to exceed that provided in the original estimates of 1913." [p. 29.]

Surface and Subsoil Drainage.

According to the Annual Medical and Sanitary Report for Nigeria, 1915 :—

" Lagos is the only place where a system of subsoil drainage has been laid, and here it has proved very effectual, preventing, in the area affected, the periodical floods which used formerly to occur during the rains.

" Permanent surface drainage has not been extended to any great extent, but the amount which has been completed has proved useful. At Forcados and Burutu especially, but also at other stations, considerable work has been accomplished in extending the existing systems of earth drains and in clearing and keeping clear those previously cut. At places such as those named, tidal drains are the only means of removing a large quantity of the water which occasionally accumulates, and their maintenance in good condition—which is essential—involves a considerable amount of labour." [p. 53.]

Filling by Dredgers.

The dredger, according to the Annual Medical and Sanitary Report for Nigeria, 1915, is fulfilling good work in that Colony.

"Reclamation has been carried out at Apapa and Forcados by means of sand deposited by the pump dredger. At the former place 44,000 cubic yards have been deposited, and at the latter considerable improvement has been effected.

"At Lagos, Bonny, Burutu and Port Harcourt similar work has been done by hand labour, although at the last mentioned place, where an extensive area of swamp has been converted into useful ground, the use of mechanical transport has afforded considerable assistance." [p. 53.]

VITAL STATISTICS.

Nigeria.

The Senior Sanitary Officer writes† that the general health of the European official population has been good and compares favourably with the previous year., There were four deaths as against five in 1914, and twenty-five cases of invaliding as against forty-one in 1914.

Table showing the Sick, Invaliding, and Death Rates of European Officials.

	1914.	1915.
Total number of European officials resident ..	1,740	*
Average number resident	822·33	*
Average daily number on the sick list	12·3	11·4
Total number invalided	41	25
Percentage of invalidings to average number resident	4·98	*
Total number of deaths	5	4
Percentage of deaths to average number resident	·62	*

"It has been customary in the past to regard as invalids only those cases which became unfit to remain in the country prior to the expiration of a tour of twelve months' residential service, and this system has been adhered to in this report. During the year 1914, owing to the exigencies of the war, Medical Boards were held on many officers who had completed a year's service. These cases have not been included in the above tables, nor have cases of invaliding and death which occurred among officers on active service with the Cameroons Expeditionary Force."

Non-Official Native Population.

Vital Statistics.

"Registration being compulsory in Lagos and Ebute Metta only, statistics are available from these places only, and are as follows :—

Estimated population	77,982
Total births	2,704
Total deaths	1,960
Total deaths of infants under 1 year ..	706
Infant mortality	261·09 per 1,000 births.
Still births	140

"The total estimated population of the colony and southern provinces, based on the census of 1911 is :—

Europeans	1,650
Africans	7,856,000
East Indians	99
Mixed and Coloured	487
Total	7,858,236

† Nigeria. Annual Medical and Sanitary Reports of the Northern and Southern Provinces for the Year ending 31st December, 1915, pp. 40, 41, 42.

* Figures for 1915 are not available.

Vital Statistics, Nigeria, 1916.

Lagos.

Year.	Total births.	Birth-rate per 1,000.	Total deaths.	Death-rate per 1,000.	Deaths.						Total deaths under 5 years.	Rate per 1,000.	Total still-births not included in return.	Estimated population.
					Under 1 year.	Rate per 1,000.	Between 1 and 2 years.	Between 2 and 3 years.	Between 3 and 4 years.	Between 4 and 5 years.				
1909	2,312	43·3	1,975	37·0	729	13·6	135	90	52	49	1,055	19·4	155	53,299
1910	2,389	44·2	1,937	35·8	774	14·3	78	61	54	44	1,011	18·7	123	53,986
1911	2,430	39·8	1,873	30·7	692	11·3	74	54	38	31	889	14·5	132	61,000
1912	2,391	39·1	1,829	29·9	670	10·9	108	50	29	35	892	11·3	118	61,000
1913	2,437	38·02	1,867	29·1	643	10·03	103	85	53	33	917	14·3	129	64,096
1914	2,261	35·2	1,735	27·06	610	9·5	88	58	35	37	828	12·9	111	64,096

Ebute-Metta.

Year.	Total births.	Birth-rate per 1,100.	Total deaths.	Death-rate per 1,000.	Deaths.						Total deaths under 5 years.	Rate per 1,000.	Total still-births not included in return.	Estimated population.
					Under 1 year.	Rate per 1,000.	Between 1 and 2 years.	Between 2 and 3 years.	Between 3 and 4 years.	Between 4 and 5 years.				
1909	264	35·2	284	38·2	83	11·1	12	11	1	2	109	14·6	21	7,417
1910	262	32·3	325	40·1	83	10·2	20	4	7	2	116	14·3	17	8,104
1911	288	24·0	317	26·4	91	7·5	12	4	2	7	116	9·6	22	12,000
1912	315	26·2	346	28·8	71	6·9	21	10	6	11	119	9·9	28	12,000
1913	327	25·9	311	24·6	83	6·5	19	5	3	9	119	9·4	25	12,609
1914	337	26·7	308	24·3	96	7·6	14	9	7	3	129	10·2	17	12,609

The interest taken by the late Sir William MACGREGOR in improving the sanitary condition of Lagos is well known, and it must be gratifying to those who knew his enthusiasm to find the saving of life which has resulted.

The following statistics exhibit a steady decrease of total mortality both at Lagos and Ebute-Metta. Exception might be taken to the decreased birth-rate in both instances, but the infantile mortality (per 1,000 births) for the three years ending 1914, although still heavy, exhibits decided decrease when compared with the three preceding years :—

Vital Statistics.*

Lagos, 1914.

Number of deaths of children under five years of age	828
Percentage of deaths of children under five years to total number of deaths	47.7
Death-rate of children under one year per 1,000 births	269.7

Ebute-Metta, 1914.

Number of deaths of children under five years of age	129
Percentage of deaths of children under five years to total number of deaths	41·8
Death-rate of children under one year per 1,000 births	284·8

The grade of infantile mortality is at all times a test of sanitary conditions of a locality and, in this case, the improvement may well have been aided by the "Lagos Ladies League," founded by Sir William MACGREGOR in 1901 "for the purpose of providing medical attendance, distributing quinine, providing nursing and food and the general care of the sick poor in Lagos, particularly infant, and for the instruction and dissemination of a knowledge of the rudiments of hygiene and simple methods of treatment of disease."†

STAFF.

In dealing with a population where medical aid does not always mean the employment of men taught European methods, it must result that the statements of cause of death are not such as readily to lend themselves to compilation of trustworthy vital statistics. Therefore, to place in the position of Registrar of Births and Deaths medical men capable of making personal enquiries as to death causation, is an aid to a desirable end. Major JUSTICE, I.M.S., the Sanitary Commissioner with the Government of Madras, makes the following observation in his Annual Report for 1915 :—

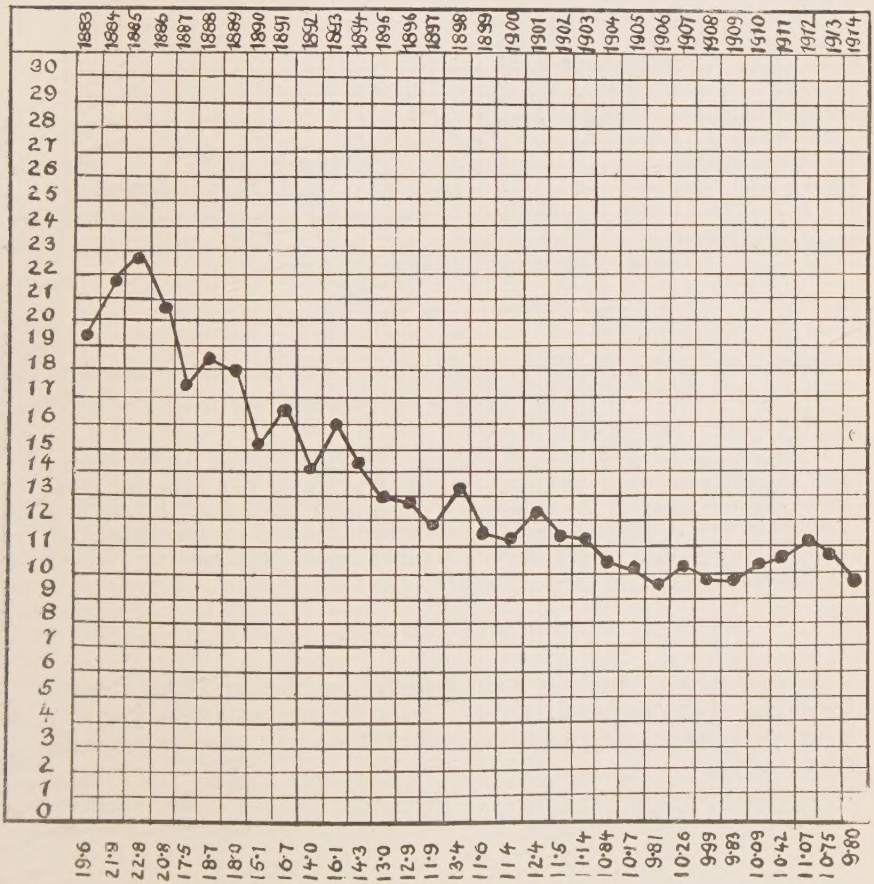
* *loc. cit.*, 1914. p. 61.
† *loc. cit.* p. 60.

"The staff employed for the registration of vital statistics both in urban and rural areas, and the methods adopted for the collection and tabulation of the results secured underwent no great change during the year under report. A scheme was recently approved by Government for the employment of better paid Registrars of Birth and Deaths in Municipalities† ; it is also proposed to entrust the work of registration of vital statistics in big towns to Medical Registrars. The latter proposal has much to commend it, and its introduction will give better results." [p. 2.]

Does Sanitation Pay ?

The annexed diagrams, extracted from the Report of the Director-General of Public Health, New South Wales for 1914, show that even if the indirect effect upon labour and commerce be excluded from consideration, the saving of life is clearly demonstrable as a result of continuous sanitary effort.

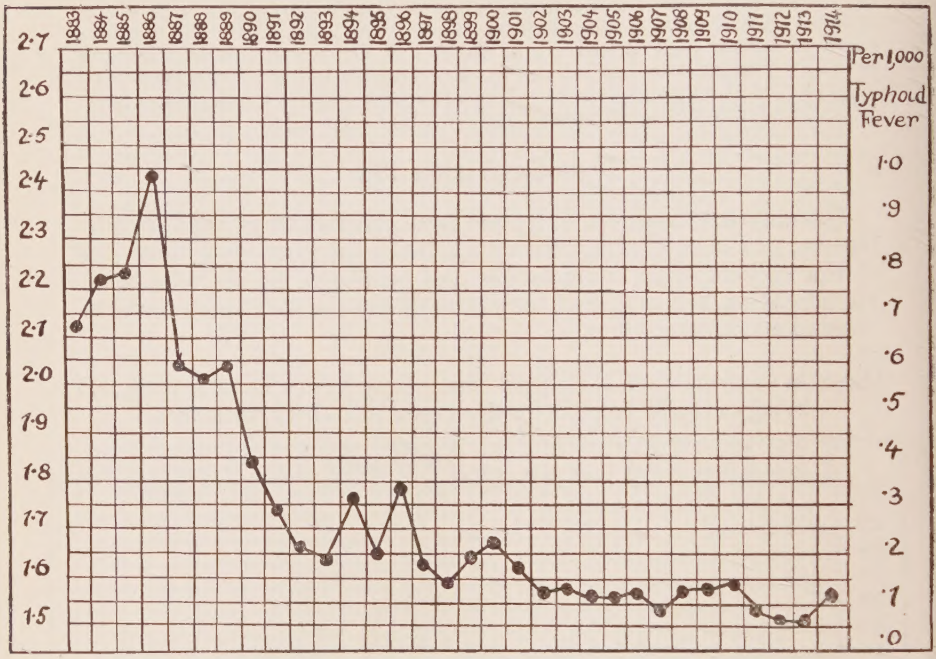
Diagram showing Annual General Death-Rate from all causes per 1,000 living in the Metropolis for the Years 1883–1914, inclusive.



NOTE.—Since 1898 the necessary correction has been made for the deaths of non-residents occurring in Metropolitan Hospitals.

† G.O. 1592 M, dated 22nd August, 1914.

Diagram showing Annual Death-Rates in the Metropolis per 1,000 living from Typhoid Fever.



NOTE.—Since 1898 the necessary correction has been made for the deaths of non-residents occurring in Metropolitan Hospitals.

LABOUR SUPPLY IN THE TROPICS.

According to the Sanitary Commissioner with the Government of Madras, the South of India makes a considerable contribution to the labour market of the colonies* :—

"Emigrants to Fiji, British Guiana, the Straits Settlements, Burma and Ceylon numbered 380,339, against 273,785 in the previous year. Immigrants (excluding the indentured emigrants) totalled 277,363 against 333,166 in 1914. Emigrants during the year exceeded the immigrants by 102,976; so it appears that there is yet great scope for labour outside the Presidency."

SUICIDES AND SEX.

According to the Sanitary Commissioner for Madras, in his Report for 1915 [p. 10], "as usual, suicides among females were more frequent than among males, the proportion being 117·6 female to every 100 male suicides."

---

* Fifty-second Annual Report of the Sanitary Commissioner, Madras, 1915. p. 2.